



**SOUTHWESTERN STATES
PORTLAND CEMENT COMPANY**



TRADE MARK

Cowham Systems

COMPLIMENTS OF
The National Underwriting Company,
350 BROADWAY, NEW YORK CITY,



(MODELLED IN PORTLAND CEMENT.)

The entire data of this Prospectus is based on actual conditions existing today; the prevailing prices of the manufactured product, existing rates of transportation and the cost of production. Our information is obtained from the United States Geological Surveys, Government Reports, Directory of American Cement Industries, *Cement and Engineering News*, *Cement and Slate*, *Cement*, *Cement Age*, *Concrete*, *Concrete Record*, *Rock Products*, *Engineering News*, *Municipal Engineering*, *Manufacturers' Record*, and other sources no less authentic.



STONE AND THE YOUTH CEMENT



PANTHEON AT ROME.

The Pantheon at Rome is the most perfect existing classical building in that famous old city. It was built by Agrippa, 27 B. C., nearly 2,000 years ago. The circular walls are about 20 feet in thickness, and the roof is a hemispherical cement concrete dome with a thirty-foot opening in the top and spanning in the clear 142 feet 6 inches. This is the most remarkable instance in the world's history showing the great strength, durability, and permanence in cement concrete construction. It has baffled the destructive elements of time for nineteen centuries and shows not a single crack today.

The Southwestern States Portland Cement Company

Incorporated under the laws of the State of West Virginia.

OFFICES: Jackson, Mich.; Minneapolis, Minn.;
Dallas, Texas.

MILLS: Dallas, Texas.

AUTHORIZED CAPITAL

Seven per cent. Preferred Stock,	\$1,750.000
Common Stock,	1,750,000

In Shares of \$100 each.

FULL PAID.

NON-ASSESSABLE.

OFFICERS:

W. F. COWHAM, *President.*

A. C. STICH, *Vice President.*

THOMAS H. DINSMORE, *2d V. Prest.*

N. S. POTTER, *Treasurer*

W. H. L. McCOURTIE, *Secretary.*

BOARD OF DIRECTORS:

W. F. COWHAM, Jackson, Mich.
Originator and head of Cowham System Portland
Cement Mills.

THOMAS H. DINSMORE, PH. D.,
350 Broadway, New York City.
President National Underwriting Co.
Director Western States Portland Cement Co.
Director Northwestern States Portland Cement Co.

W. H. L. McCOURTIE, Minneapolis.
Director Western States Portland Cement Co.
Secretary Northwestern States Portland Cement Co.
Director Kasigan Oil, Gas and Power Co.
Director Osage Window Glass Co.

N. S. POTTER, Jackson, Mich.
Vice President Jackson City Bank.
Treasurer Peninsular Portland Cement Co.
Treasurer Northwestern States Portland Cement Co.
Assistant Treasurer Western States Portland Cement Co.
Treasurer Jackson, Ann Arbor & Detroit R. R.

A. C. STICH, Independence, Kas.
President Citizens National Bank.
Treasurer Western States Portland Cement Co.
Director Northwestern States Portland Cement Co.
President Coffeyville Vitrified Brick & Tile Co.

C. H. WAGNER, Minneapolis, Minn.
Capitalist.
Ex-President Wagner Milling Co.

J. H. McNAIR, Halstead, Kas.
Cashier Halstead Bank.
Director Northwestern States Portland Cement Co.
President Kansas Milling & Export Co.
President Blackwell Milling & Elevator Co.
Secretary and Supt. Halstead Milling & Elevator Co.

W. W. HAWLEY, Huntington, Ind.
Director Huntington County Bank.
Director Peninsular Portland Cement Co.
Director Western States Portland Cement Co.
Director Northwestern States Portland Cement Co.
Director Western Lime Co.

Address all communications to

THE SOUTHWESTERN STATES PORTLAND CEMENT CO.,

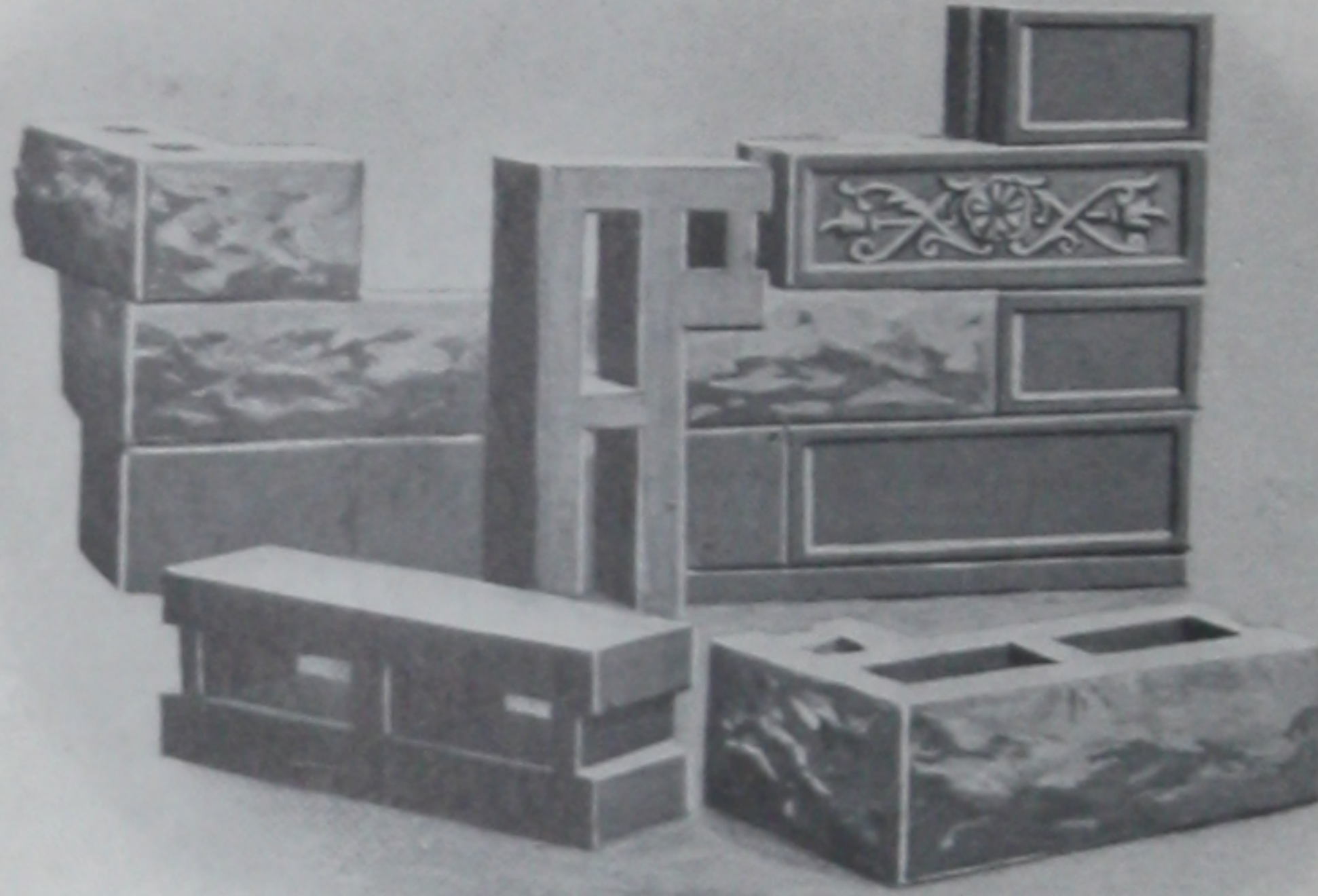
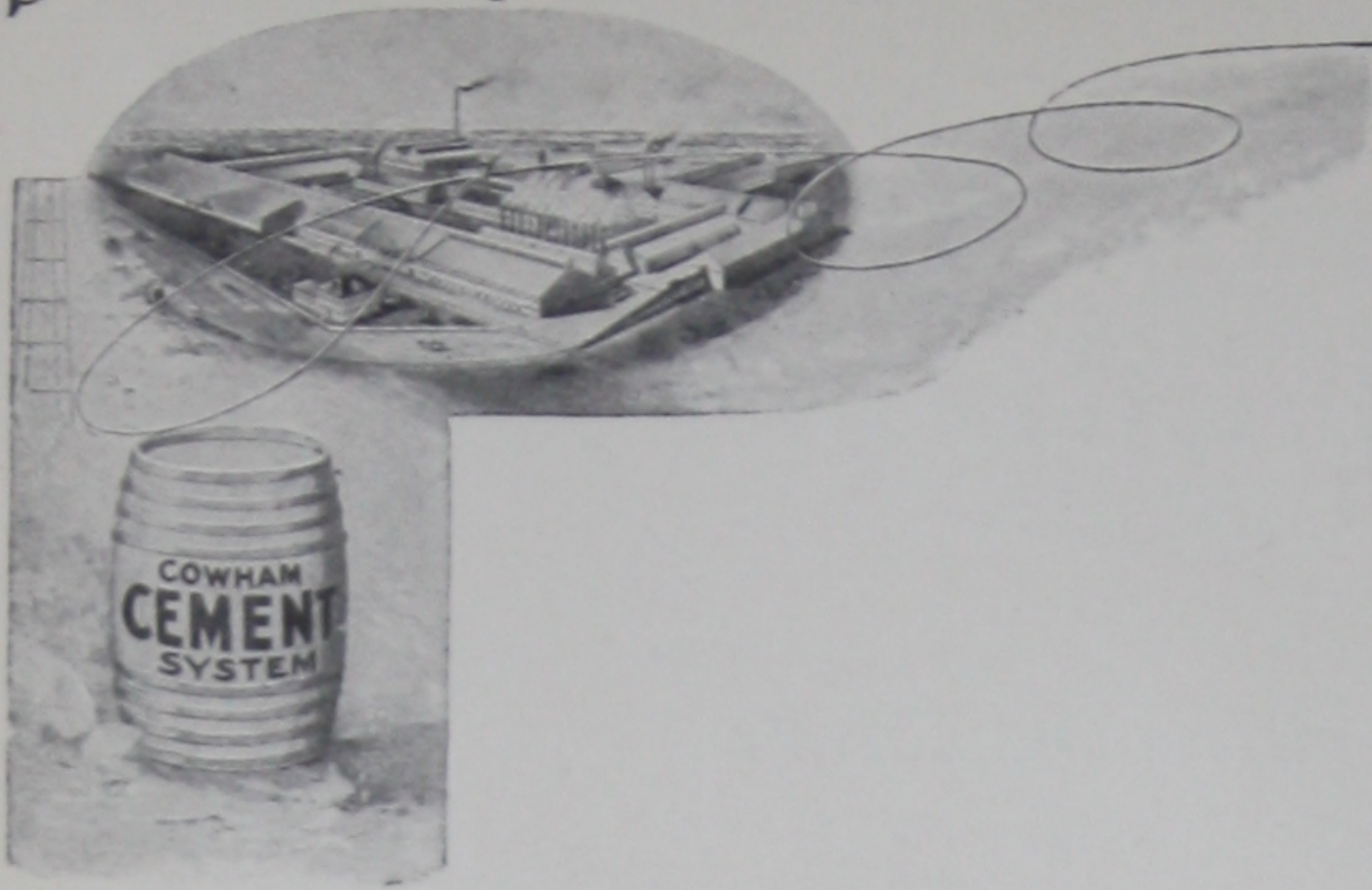
Nos. 515, 516 & 517 Andrus Building,

MINNEAPOLIS, MINNESOTA.

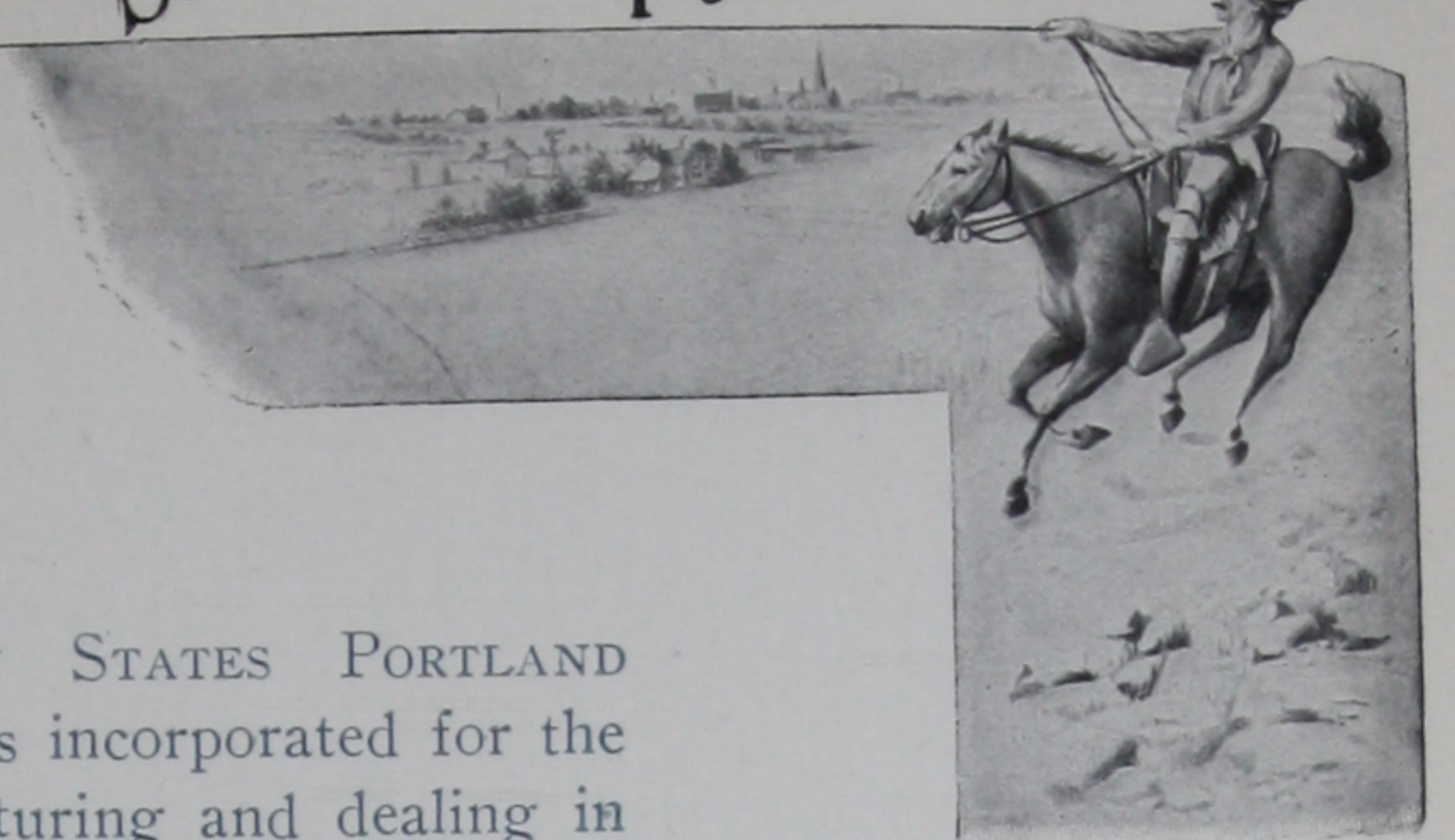
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BY THE SOUTHWESTERN STATES PORTLAND CEMENT CO.

SOUTHWESTERN STATES
PORTLAND CEMENT CO.



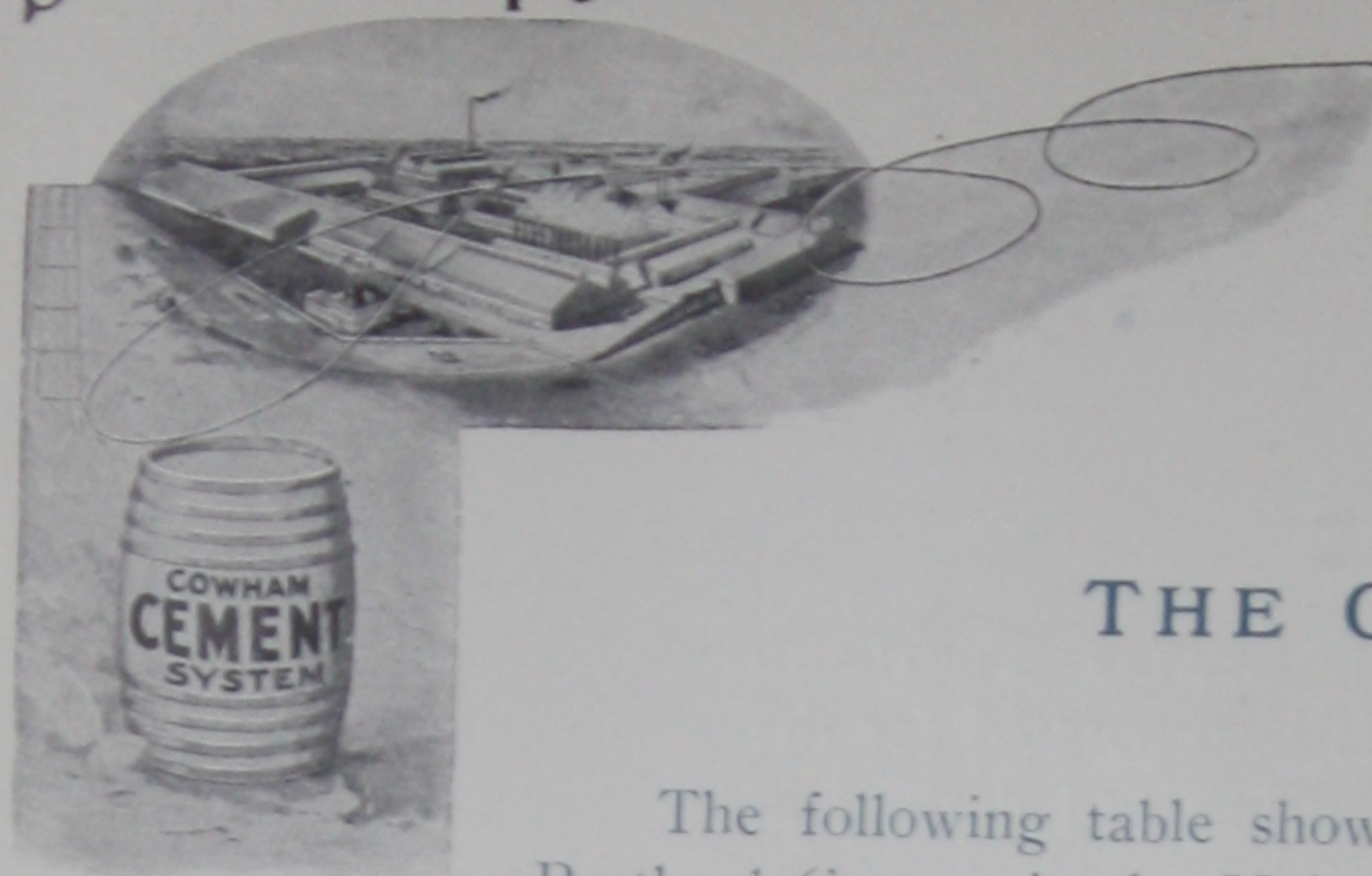
Portland Cement Building Blocks.



THE SOUTHWESTERN STATES PORTLAND CEMENT COMPANY is incorporated for the purpose of manufacturing and dealing in Portland Cement, lime, crushed stone and all products of which they form a part; the manufacture and sale of other mineral products and by-products; the mining or digging of minerals, gas and oil, and the sale thereof; the dealing in gas and oil rights; the purchase and leasing of gas, oil, and mineral lands and the re-sale and re-leasing thereof. The owning, holding and operating of any railroad necessary primarily for said Company's operation and the holding or owning of any interest in any railroad or other corporation or joint stock company permitted by law; the purchase and holding of real estate for the laying out of a town at or near the works of said Company, the erection of buildings thereon, and the sale or lease of any of said lands or buildings; the carrying on of a general merchandise business in such town or at said works. The production, development, transmission and sale of electric and other power and such other things as may be convenient or necessary to its said business.

The object of this prospectus is to bring THE SOUTHWESTERN STATES PORTLAND CEMENT COMPANY before the people and to interest them in this enterprise. It will treat briefly of the nature of Portland Cement, the modern process of manufacture, and the varied and constantly increasing uses to which the material is being adapted, illustrating late developments and suggesting the future possibilities of the cement business. It will also present a brief account of the property of the Company; its great natural advantages in the way of raw materials, fuel, location as to markets, transportation, etc.; the nature of the factory proposed to be built and the character and ability of the men upon whom the development of this enterprise rests.

A careful study of the facts here presented will, it is believed, lead to favorable deductions, and the conclusion that this enterprise offers returns seldom equaled in conservative and safe investment.



THE CEMENT AGE

The following table shows the constantly increasing consumption of Portland Cement in the United States since 1880:

1880.....	229,000	Barrels.
1881.....	281,000	"
1882.....	455,406	"
1883.....	576,418	"
1884.....	685,768	"
1885.....	704,396	"
1886.....	800,032	"
1887.....	1,320,400	"
1888.....	2,085,504	"
1889.....	2,040,356	"
1890.....	2,275,186	"
1891.....	3,443,126	"
1892.....	2,988,094	"
1893.....	3,264,801	"
1894.....	3,436,864	"
1895.....	3,987,719	"
1896.....	4,532,620	"
1897.....	4,768,699	"
1898.....	5,706,102	"
1899.....	7,760,654	"
1900.....	10,868,703	"
1901.....	13,633,651	"
1902.....	19,191,657	"
1903.....	24,594,942	"
1904.....	27,474,290	"
1905.....	36,929,945	"
1906.....	47,107,202	"

During the first half of this period the greater portion of the Portland Cement consumed in this country was foreign or imported cement—the domestic production not equaling the importation until the year 1897. During the second half of this period the imports have averaged about two million barrels annually.

There is today more foreign Portland Cement in transit to the United States than ever before in the history of this country, and, because of the tremendous increase of consumption of this material occasioned by the recently recognized merit of this form of construction, the indications are that the present will be a record year for the importation of foreign Portland Cement—

*AND A CEMENT FAMINE HAS PREVAILED
ALMOST CONSTANTLY.*



Texas

New Mexico

Old Mexico

Louisiana

Mississippi

Arkansas

Indian Territory

Oklahoma

The Natural Markets of this Company
are unprovided with local production of
High-grade Portland Cement.



A BRIEF STUDY IN PORTLAND CEMENT

THERE has recently been so marvelous a growth in the consumption of Portland Cement, and its uses in great works of construction have multiplied so rapidly that a little digest of information concerning it will doubtless prove acceptable here.

Portland Cement is a mechanical mixture varying within narrow limits, containing several definite compounds produced by the proper calcination of finely divided limestone, marl, or other calcareous material with clay. To manufacture a good article there must be proper selection of material, careful workmanship, and the exercise of precaution to prevent entering into, or remaining in, the finished product any inferior or injurious materials.

The limestone or marl supplies calcium, while the clay furnishes silica, alumina and iron oxide. At a temperature of about 3,000 degrees Fahrenheit chemical action takes place in the kiln, resulting in the formation of cement clinkers composed of calcium silicate, calcium aluminate, and aluminum silicate. This clinker, when finely ground, is the Portland Cement of commerce. If the composition, in molecule and mass, is correct in this mixture the addition of the proper amount of water to the finely ground material causes crystallization, whereupon the mass begins to harden into rock and continues to increase in strength for several years before reaching its maximum.

This process is markedly different from that of the manufacture of natural cement which consists simply in the calcination and grinding of a natural rock containing approximately the ingredients for a cement, but lacking uniformity and definiteness in composition. Portland Cements range much higher in specific gravity than do natural cements, and therefore the latter are sometimes called the light cements.

If sufficient care be not exercised in the manufacture of Portland Cement free lime will be present when the product comes from the kiln and must be removed by exposure to the atmosphere. If this be not done the free lime will cause swelling of the cement in barrels and checking and "blowing" in finished work. Sufficient care and the correct process of manufacture will, however, make practically unnecessary this maturing and "purging," as it is called.

Magnesia and sulphuric anhydride are always found, to a greater or less extent, in Portland Cement; and occasionally the alkalies, potash and soda, occur also; but these are unimportant if in very small proportions.

Purity of raw materials, their correct chemical combination, a perfect system of manufacture together with experience and scientific accuracy are essential for the production of a uniform, high-grade Portland Cement.

Great strides have recently been made in this direction; the methods of manufacture having been continually perfected, until to-day high grade Portland Cement is regarded throughout the world as the best building material known and one of the necessities in all modern construction.



AMERICA'S SUPERIOR PRODUCT, AND PROCESS OF MANUFACTURE

ONLY a few years ago all Portland Cement was imported from England and Germany. Gradually English makers lost control and the German product became the standard because of the greater care and more advanced methods employed by the Germans, who produced, in consequence, a higher grade of cement. To-day, however, the quality of the cement manufactured in the United States excels the foreign product. This is extremely gratifying, when the degree of technical skill required in making a high-grade article is taken into consideration. The reason for the superiority of American Portland Cement lies, not only in unsurpassed raw materials, but also in the modern and improved method of American manufacture.

No better testimonial of the quality of the Portland Cement now produced in this country can be found than that given in the reports of Mr. Richard Humphrey, Cement Inspector for the City of Philadelphia, for the years 1896 to 1899. These reports include tables showing graphically the results obtained from all cements tested in the Philadelphia City Laboratory in the years mentioned. These tables show that the average of all American cements, both neat and with sand, is distinctly higher than either the English or the German. This evidence, with numerous similar records obtained by government and private engineers, warrants the claim that there is today no Portland Cement made in any foreign countries that is equal in quality to the leading American brands.

Mr. William Harper, Manager of the Commercial and Intelligence Bureau of London, in a report says: "The Americans have adopted a process of manufacturing cement by means of rotary roasting mills which will drive England, France and Germany practically out of the field. By the aid of simpler and better machinery the Americans are able to make their article in eight hours, while England, with its ancient, cumbersome equipment, requires three or four weeks. The cost of the American product is less than half that of the English."

So noted an expert as Mr. H. Howard Humphrey, M. I. M. E., A. M. I. C. E., recently read a paper before the British Architectural Association in which he plainly declared: "The cost of producing Portland Cement in America by the rotary kiln process is approximately three-fourths of that of the cheapest process in vogue on the River Thames, and Medway, and the output is also very largely increased."

City Engineer Ericson, of Chicago, is quoted in one of the daily papers of that city as saying: "I do not know of a barrel of Portland Cement of foreign make which has gone into construction here in Chicago during the last two years. There never was a brighter industrial future than that now before American makers of Portland Cement."



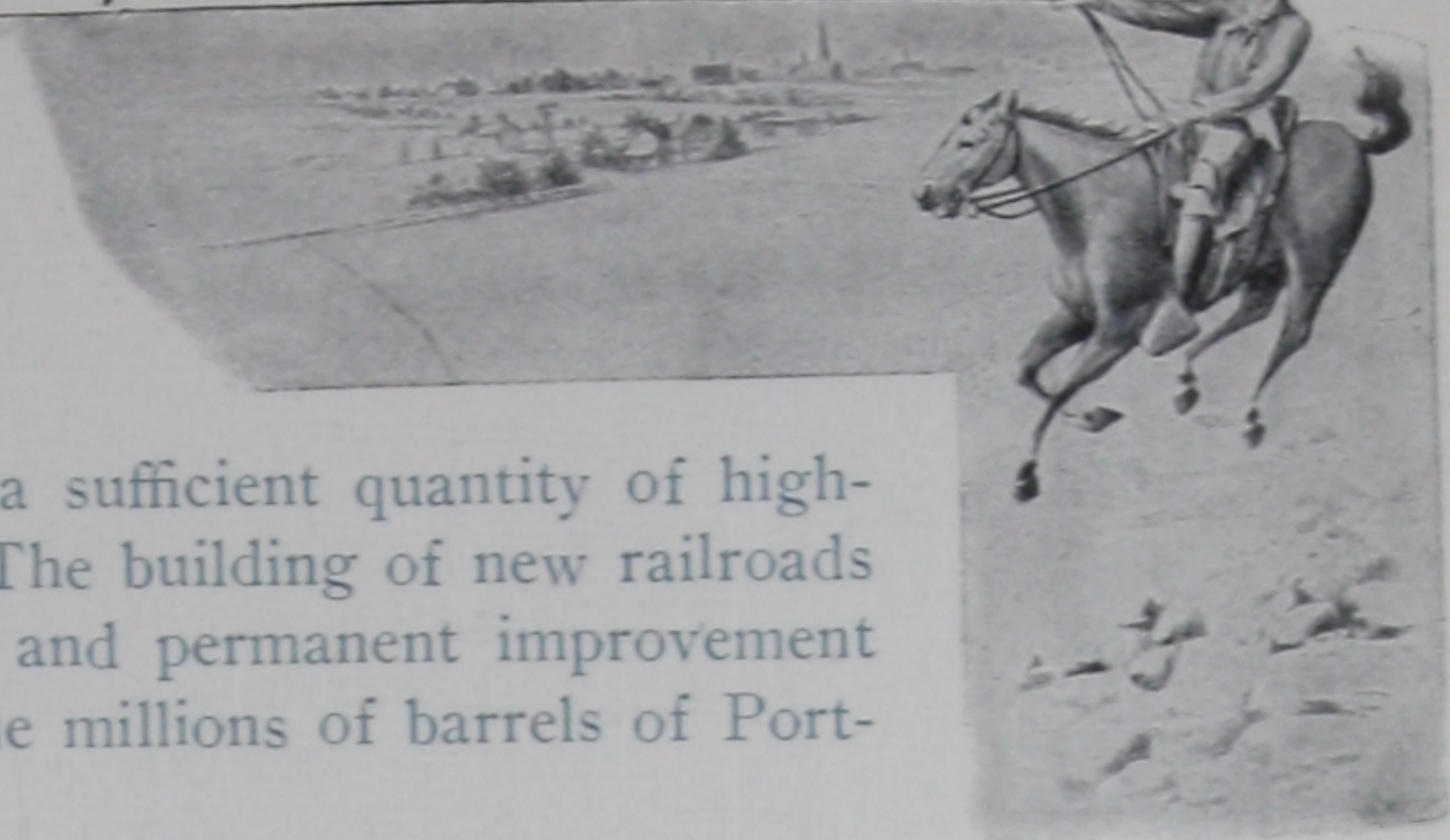
A GREAT AND STABLE INDUSTRY

PORTLAND Cement is daily becoming a more and more important factor in the industrial and commercial development of all countries. Its ready adaptability and superior qualities for use in constructions of all kinds are being demonstrated throughout the land, and it is now regarded as the chief building material of the age.

The consumption of Portland Cement in all countries is increasing with most wonderful rapidity. A reference to the table given on page 8 will show that in the single year 1906 the consumption of this material in the United States practically equaled the total consumption for the entire period of twenty years preceding 1900. During the five years preceding the year 1900 the consumption of Portland Cement increased at the average rate of nearly 1,000,000 barrels annually. For the six years following the year 1900 the average rate of increase reached the enormous sum of about 6,000,000 barrels per annum, and for the year 1906 (although a veritable cement famine prevailed throughout the country and large and important works were delayed or suspended for the lack of cement) the increase was far in excess of that of any previous year, the total consumption being 47,107,202 barrels. This is a rate that has not, perhaps, been equaled by any other article used by man, and is due to the multitude of new applications which Portland Cement is constantly finding and its rapidly increasing use in place of other building materials in constructions of all kinds.

It is a noticeable fact that while the consumption of Portland Cement in the United States is constantly increasing at such a tremendous rate, displacing wood, brick, stone, steel, terra cotta and other building materials, the consumption of natural rock and slag cements is rapidly decreasing (the consumption of natural rock cement having decreased from approximately 10,000,000 barrels in the year 1899 to 8,000,000 barrels in the year 1900, and 4,000,000 barrels in the year 1906; and the consumption of slag cement having decreased at even a greater rate), which proves beyond question that Portland Cement by reason of its merit is not only sweeping before it every form of the usual structural materials but is also destined to completely replace natural rock and slag cements in America as it has already done in Germany, where, previous to 1852, every barrel of cement consumed was natural or hydraulic cement.

The production of cement in the United States does not by any means meet the present, and much less the increasing demand. Notwithstanding heavy importations, together with a marked increase in home production, a cement famine prevails, in consequence of which the amount consumed is considerably less than that required by the country. Many of the large government, municipal, and railroad contracts are of necessity being carried



over to next season for the sole reason that a sufficient quantity of high-grade Portland Cement cannot be procured. The building of new railroads and canals now projected, also the extension and permanent improvement of the old lines will for years to come consume millions of barrels of Portland Cement.

In view of the great extent of territory still to be developed, the magnitude of building operations, public works, etc., and the general progress and development sure to come, it is absolutely certain that the consumption of Portland Cement in this country will continue to grow from year to year as experience proves the utility and permanency of concrete construction. Furthermore, the consumption of cement per capita in this country is still much less than the amount consumed per capita in some European countries, showing that the industry here is still in a comparatively undeveloped state. It is therefore certain that no country presents a better field or a more promising market for high-grade Portland Cement than does the United States.

NATURAL ADVANTAGES

The natural advantages determining the value of a Portland Cement manufacturing proposition are of a complex nature, depending upon a number of distinct factors, ignorance of the respective importance of which frequently leads to disaster. The most important of these are:

- Amount of raw materials available.
- Physical character of the materials.
- Chemical composition of the materials.
- Location with respect to water supply.
- Location with respect to labor.
- Location with respect to fuel supplies.
- Location with respect to markets.
- Location with respect to transportation routes.
- Choice of mechanical appliances.

All of these the SOUTHWESTERN STATES PORTLAND CEMENT COMPANY possesses to an extent unapproached by any other producer. Coupled with these natural advantages, it is especially fortunate in having that no less important factor of success, the competent and expert management of men thoroughly familiar with every detail of cement manufacture.

SOUTHWESTERN STATES PORTLAND CEMENT CO.



PROPERTY

THE property to be utilized by the SOUTHWESTERN STATES PORTLAND CEMENT COMPANY consists of about 300 acres of Portland Cement rock and clay shale deposits lying in close proximity but distinctly separate from each other and situated near the corporate limits of Dallas, Texas, directly on the main lines of the Texas & Pacific and the projected Texas Northern Rys., and in easy access to the Santa Fe and Ft. Worth Rys.

The mill site is most favorably located on a broad plateau, the gradual decline from the low bluff containing both rock and shale affording excellent drainage to the river below and permitting the transportation of raw materials to the mill by gravity, the added weight of loaded cars returning the empty ones to quarry and pit. In addition to the ordinary river water supply close at hand, this Company's property lies in a section supplied with flowing artesian wells furnishing an abundance of mild, soft water which comes to the surface with great force and is admirably adapted for manufacturing purposes.

The unique location of this Company's mill, just outside the corporate limits of Dallas, assures a low tax rate on this Company's property permanently, while the mill site, being so close at hand and directly connected with both Dallas and Ft. Worth, two of the principal cities of Texas, by interurban electric lines, places the company in a position to easily procure and retain the common labor and high class artisans necessary to keep the plant in constant and uninterrupted operation. The mild and even climate at this point is also an important factor as it permits of the operation of the plant and the use of its product in construction work continuously during every month of the year.

The physical properties of the raw materials are excellent, as both the rock and shale will require practically no stripping in handling; and as the rock is soft in texture and when blasted fractures along both horizontal and vertical lines into small cubes, it can be quarried, delivered to the crushers, and reduced to the fine powder required for mixing at a comparatively very slight expense.

RAW MATERIALS

THE quality and quantity of the raw materials contained on the Company's property have been thoroughly examined and tested, core borings and analysis having been made by eminent experts and chemists especially fitted for this work, and their reports show all the materials to be practically pure and almost entirely free from certain foreign substances which are often found in sufficient quantities to render the materials worthless for the manufacture of a high-grade Portland Cement. Our own engineers and experts have examined the entire property in detail and all report it to be a rare deposit of superior quality, unlimited in quantity, and perfectly adapted, as to location, for the business to be conducted success-



fully and profitably. Such raw materials are hard to find; so hard indeed that we believe it to be practically impossible to find in the entire Southwest another such property containing the two raw materials of equal quality so admirably located. The discovery of the property will be more fully appreciated when it is understood that to-day fully 85 per cent of the Portland Cement produced in the United States is made east of the Mississippi River, and at least 75 per cent of that manufactured in this eastern division from these materials is made in the Lehigh Valley region of Pennsylvania, entirely within a radius of fifteen miles of Allentown—the greater portion consumed in this southwestern section is either shipped from a distance at a high freight rate or imported from abroad.

FUEL

THE expense connected with the *manufacture* of Portland Cement is divided into several items, viz., getting out raw material and transporting it to the mill; reducing and preparing the raw material by grinding and mixing; burning the prepared mixture of raw materials to produce clinker; grinding the resultant clinker into an impalpable powder, which is the finished product, Portland Cement; packing and getting ready for shipment.

One of the most important and largest items in the cost of *manufacturing* this product, is *fuel*. Fuel is necessary not only to furnish power for operating the mixing, grinding, conveying and all other machinery, but also for generating the immense amount of intense heat, which it is necessary to maintain in the furnaces for calcining the raw material after it has been properly prepared.

In this respect the SOUTHWESTERN STATES PORTLAND CEMENT COMPANY is most favorably located; the Pipe Line running from the great oil fields of Indian Territory and Kansas to the Gulf passes directly through our property and the Oil Storage Tank Farm is immediately adjoining, hence we are right at the base of an abundant supply of cheap crude oil for fuel. Being also in easy reach of the Corsicana and Henrietta oil fields of Texas, as well as the recently discovered natural gas fields, and directly connected with the Texas and Indian Territory coal fields, this Company is assured at all times a certain and ample supply of desirable fuel at a minimum cost.

This is an advantage that no other possible location for a cement plant in this district can offer, and, taken in connection with this Company's admirable shipping facilities, doubly ensures the permanent advantage of producing cement, in its best form, at this company's plant, and delivering it out upon this market at a total cost immeasurably less than it could possibly be done from elsewhere; and renders this proposition one of the most desirable Portland Cement properties ever discovered.



ADVANTAGES OF LOCATION

WITH RESPECT TO
MARKETS, TRANSPORTATION ROUTES, ETC.

NEXT in importance to the abundant supply of good raw materials and fuel comes the question of location with reference to the markets at which it is proposed to deliver the product of the mills, as this factor alone enables manufacturers favorably located to survive competition, which would prove ruinous to others. In this respect Dallas is an ideal location, situated, as it is, in the very heart of the producing region of the Great Southwest. This great Central Southwest section, rapidly growing and endowed with unlimited natural resources, is to-day one of the best and most extensive markets in the country for Portland Cement. The rapid development of this region and the constantly increasing uses to which Portland Cement is being put, insures that for years to come the demand will be largely in excess of the local supply.

The ability to reach such markets often determines the destiny of manufacturing undertakings. The advantages of transportation cannot be over-estimated in an enterprise of this nature. To locate a Portland Cement plant with poor shipping facilities is simply to invite disaster. Cement is a heavy substance and the cost of transporting it to markets is commonly a very considerable portion of the cost to the consumer. A mill which enjoys the advantage of low freight rates can sell its products at a profit at prices with which other mills paying higher rates cannot compete. Cheap transportation is such an important factor in an enterprise of this nature that it alone may add very materially to the profits on the investment.

Over 60 per cent of the Portland Cement produced in the United States is made in the Lehigh regions of Pennsylvania. This eastern section, together with the Michigan territory, constitute the two great cement producing sections of the United States, leaving but a very small percentage of the output of this country to be made west of the Mississippi River, Dallas, Ft. Worth, Sherman, Waco, Austin, San Antonio, Houston, Galveston, Beaumont and El Paso, etc., the distributing points for this great locally unsupplied territory, are constantly demanding more cement, and their dealers are obliged to contract with eastern and foreign mills for large quantities annually, and to pay the high freight rates incident to the long haul by rail. Since the freight rate to this territory from the nearest outside cement manufacturing field is \$1.19 and upwards per barrel, it alone gives to this Company a handsome profit and the products of these distant Portland Cement plants now consumed in this territory, though enormous



and still increasing, should be largely excluded from this market by transportation charges alone, as soon as a high-grade Portland Cement is locally produced and placed upon the market at a reasonable price.

This Company, with its warehouses directly upon the tracks of nine of the most important southwestern trunk line railroads, radiating in sixteen different directions, is in direct communication with and has facilities for reaching the important cities and towns of the great southwest, at a freight rate that renders successful competition in this territory from other factories less favorably located practically impossible. Situated as it is at Dallas, the greatest railroad center of the Central Southwest, this Company will be further enabled at all times to move its products rapidly and will be independent of the congestion of traffic which at busy seasons frequently delays shipments. In this respect it is given so distinct and great an advantage over all other producers that it can without doubt control the cement trade of this particular territory and do so upon a highly profitable basis.

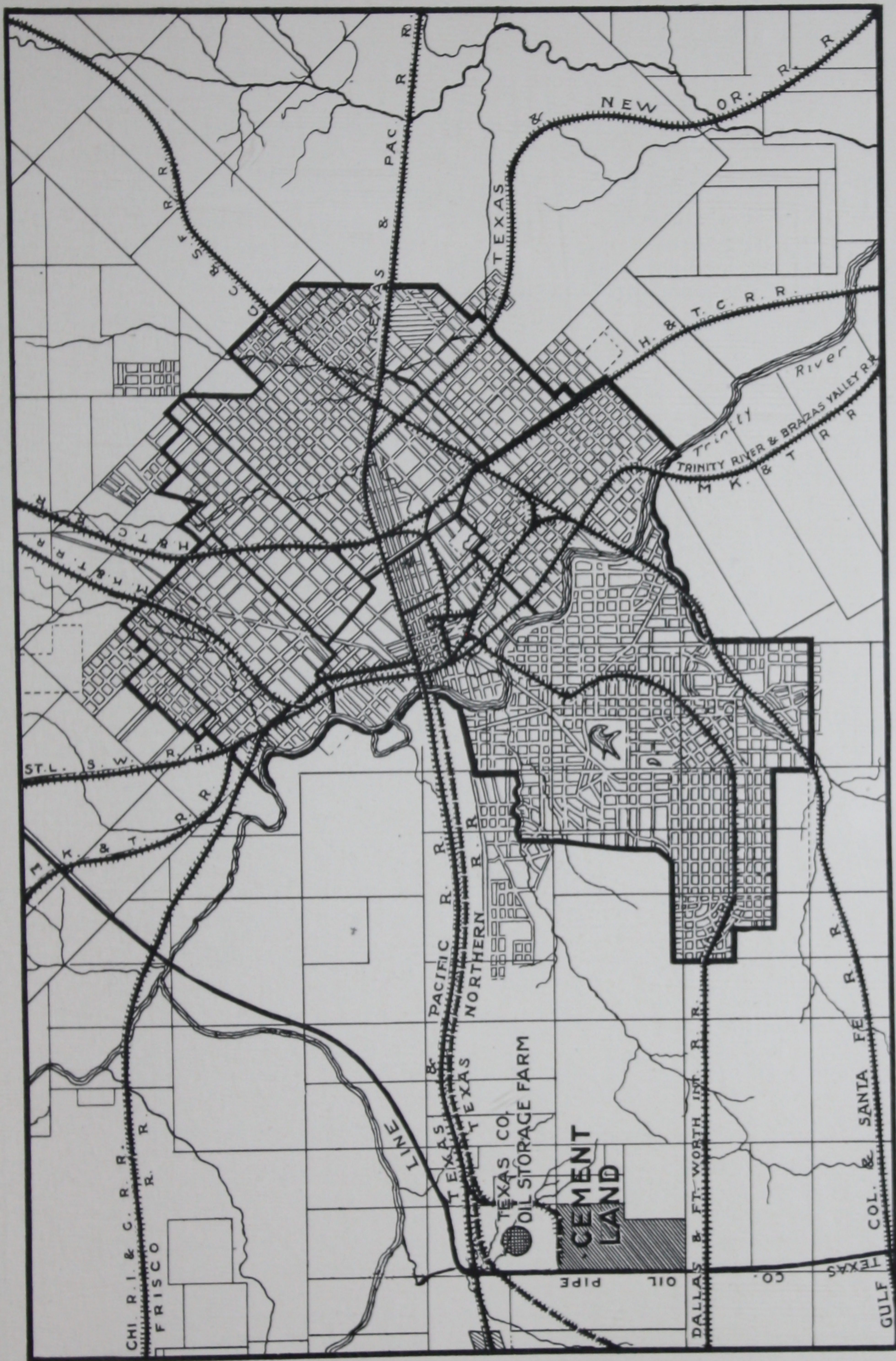
It is evident from the foregoing that, with its splendid deposits of raw materials, its abundance of cheap fuel, its proximity to great, increasing and locally unsupplied markets, and its remarkable transportation facilities, this Company has one of the finest cement properties on the continent. It would be difficult to name any respect in which the location at Dallas could be improved upon. These natural advantages when developed by the corps of experienced men associated with this Company and handled by conservative and reliable men experienced in the commercial side of the Cement business should insure the success and stability of this enterprise.





The trend of foreign trade through southern gulf ports has become one of the most clearly-marked economic changes in American business life. Here are located the best harbor facilities of the world, and the completion of the Panama canal will make the Gulf of Mexico the center of the world's commerce. The Gulf Stream of the Atlantic and the Trade Winds of the Pacific make it the pinacle from which all the great commercial markets of the world are "down hill." Not only has it the products of the marvelous resources of the two Americas awaiting an outlet, but it will be the great trade highway between all the countries of Europe and the far East. Already second in importance of all ports in America, Galveston, Texas, will become the trade center from which will flow the great tide of commerce that will make her the most important port in the world.

From the above map the central location of this company in the midst of one of the greatest producing sections of the world, and its unexcelled shipping facilities will be at once apparent. This Southwestern section is really an Empire in itself. A recent Government report shows that Texas comes nearer to producing everything required for man's needs than any similar sized territory in the world. In addition to its varied mineral resources, the greater portion of the state is one of the richest agricultural sections of the globe; grains, fruits and vegetables of every kind are grown in abundance and about one-third of the entire cotton supply of the world is here produced. She has more miles of railroad and is building more miles than any other state in the Union. The territory within a radius of one hundred miles of our plant already contains a population of about 2,000,000 people and, as the knowledge of above conditions is today causing an unprecedented flood of immigration, increasing the population of this fertile Southwestern section at a tremendous rate, the foundation of a great commonwealth is being laid on broad, solid lines and the future possibilities of Texas are unlimited. Its present rapid development, phenomenal as it is, is merely the natural, substantial growth of an intensely practical and productive country. In entering this section, this company becomes practically a



Map showing Dallas and its exceptional railroad facilities and the admirable location of our Cement Properties.

With nine railroads radiating in sixteen different directions from Dallas, a city of about 100,000, and having a constant average of over 1,000 freight cars entering and leaving daily, it will be readily seen that our traffic conditions are the best and the car-shortage situation, so noticeable at times in some locations, should be entirely eliminated here. These railroads also give this Company direct connection with the vast coal fields of Texas and Indian Territory, which, together with the great Oil Pipe Line passing directly through its property, the Oil Storage Tank Farm being immediately adjacent, and the recently discovered natural gas fields close at hand, insures to this Company a cheap and unfailing general fuel supply.



FACTORY AND EQUIPMENT

TO investors in the Portland Cement industry, the question of factory, its process, equipment, capacity, and quality of cement it will produce is of vital importance.

Poor, incompetent, or dishonest management can be promptly displaced, but it is a difficult, impractical and expensive undertaking to replace a poorly designed and cheaply constructed cement factory with a good one. To insure constant good earning power, a Portland Cement factory must first of all be constructed with the view of permanency and have capacity corresponding with the capital so invested; it must be equipped with machinery that is certain to run and do its work from year to year without trouble and annoyance, and the process of manufacture must be one that will insure a uniform, high-grade cement.

The history of this industry in both Europe and America, proves conclusively that the designers and builders of the most successful Portland Cement factories, together with the machinery therein installed, have gained their knowledge after years of practical experience in cement making. It is therefore of the utmost importance to prospective investors and those interested in the cement industry that the men upon whom this responsibility rests should be men of practical experience and unquestionable ability.

The factory to be built at Dallas, Texas, will be the product of the best mechanical and engineering skill in America, and having an estimated daily capacity of 2,500 barrels. The power generated will be electrically distributed throughout the plant, which will be modern in every detail; the buildings will be convenient and equipped with the best and strongest types of machinery, all of which will be specially designed for this plant.

THE SOUTHWESTERN STATES PORTLAND CEMENT COMPANY is especially fortunate in having associated with it a staff of the most practical cement engineers in this country, who have designed (including the machinery itself) and superintended the construction of many of the most modern and successful cement mills in North America; men who are identified with it in the cement business, and who are recognized leaders in cement manufacture.

Under these circumstances there is positively no guess work, no experimenting, and the most economical and perfect system of manufacture is insured; hence the best product.

It is a notable fact that the remarkable growth and healthy condition of the Portland Cement industry has offered great inducement to inexperienced engineers and promoters to engage in the business, who of necessity must obtain their experience slowly, and possibly at the expense of investors. It is well known to cement manufacturers that millions of dollars have been spent in Europe and America in learning and experimenting in the economical manufacture of a high-grade Portland Cement; that in many of the factories now in existence large amounts of money have been spent in processes and equipments which proved useless, and that there is great danger of possible misguided judgment founded upon lack of experience and knowledge in connection with the construction and equipment of cement mills.

In view of the foregoing, surely it is a satisfaction to know that this Company, as previously stated, has associated with it in this business a staff of engineers who are pioneers in cement manufacture; who are specialists in designing cement mills, and to whom the world is largely indebted for



the standard of perfection reached in the manufacture of high grade Portland Cement, their latest and crowning efforts being the magnificent plants of THE WESTERN STATES PORTLAND CEMENT COMPANY, Independence, Kansas, and THE NORTHWESTERN STATES PORTLAND CEMENT COMPANY, Mason City, Iowa, which are acknowledged by experts, both in Europe and America, to be the most modern and best equipped Portland Cement plants in the world.

EXPERIENCED SUPERVISION

NOT all cement is high-grade cement. To manufacture and maintain an efficient high-grade Portland Cement, the most indefatigable supervision and careful handling of raw materials are absolutely essential; otherwise a low grade "natural" cement is the result. If the proper analysis and proportioning are not attended to, or if the calcining is imperfect, or if the necessary fineness of grinding is not maintained, (and it should be understood that a lower expense of manufacture can easily be secured by neglecting these requisities) a low grade article is produced, and one disastrous and costly to the consumer. The manufacture of this material is an intricate process and it is more important in Portland Cement manufacture than in almost anything else not only to have the highest type of equipment throughout, but also to have experienced, conscientious work in connection with every detail.

One of the most frequent causes of failure of many manufacturing plants is, that after being designed and constructed they are turned over to the management of some person or persons who know nothing whatever regarding their operation. With but little or no regard for their knowledge of or experience with cement factories or cement machinery, consulting mechanical engineers of reputation are often employed to furnish plans and designs for cement plants; they having not only no particular interest in the work of construction, but also having no interest whatever in the operation of the plant, or the future success of the enterprise.

The management of the organization responsible for the erection of the magnificent factories illustrated in these pages, realizing the importance of trained supervision in their operation, as well as their construction, early associated with them in the business not only the experienced engineers who have the general supervision of these plants after construction as well as before, but also surrounded themselves with competent and experienced cement makers and heads of departments, all of whom are directly interested from the manufacturers' standpoint in the future success of the enterprise. It is therefore absolutely certain that every safeguard possible is provided that will insure not only the most improved plants and equipment, but also trained supervision in their operation.

TRAINED BUSINESS MANAGEMENT NECESSARY

TO insure the success of large manufacturing undertakings, trained business management is of vital importance. The men upon whom this responsibility rests, should first of all be honest and trustworthy; besides, they should have ability and experience in the business in which they are engaged. In the development of this enterprise much care and consideration has been given to this point. The management selected is of the very strongest organization now engaged in Portland Cement manufacture, and the directorate of this Company is composed of men of substantial financial interests, experience and moral standing from whom we have a right to expect nothing but safe and conservative management in the administration of affairs.



PROFITS

It is now generally conceded by all that Portland Cement is the one great essential building material of the future—surpassing steel and all other constructive materials—and while its use seems to have already become almost universal in building operations of all kinds, it is yet plainly apparent to those best informed on the subject that we are even now in infancy in the manufacture and use of this material, and that this great industry, when properly handled, has the very brightest future possible before it. Portland Cement is a permanently marketable article that does not go out of fashion. A careful investigation of the industry in general proves conclusively that, when properly located and managed by men of known experience and proven success, it has been a universally profitable and staple business and has earned handsome dividends, as evidenced by the following press notices:

It is generally conceded that securities based on the Portland Cement industry have a very promising future in view of the broadening field for operation of the companies. Stock of the American Cement Company, it seems to many, is a very attractive purchase around current quotations. But very little of this issue, however, comes on the market due to the fact that it is closely held by investors.—*Stockholder, Philadelphia, Pa., February, 1900.*

PROSPEROUS INSTITUTION.—It should be gratifying to Reporter readers to learn that the mammoth plant of the Western States Portland Cement Company (Cowham-McCourtie Syndicate), which started manufacturing cement only about ninety days ago, is already upon a splendid paying basis and that an immense financial success for its owners is assured. On account of its perfect equipment this company's product is far superior to any heretofore placed upon this market and its cost of manufacture is less than in any other cement plant in the world. The manufacture of cement, properly handled, is a prosperous industry and Independence should certainly be proud of her concerns located here.—*Independence Daily Reporter, Feb. 8th, 1906.*

At a meeting of the Board of Directors of the Peninsular Portland Cement Company (Cowham System), of Jackson, Michigan, on December 23rd, the regular 7 per cent dividend on Preferred Stock was declared, payable on or before January 1st, 1903. The Company has enjoyed a very prosperous career, and are now doing an enormous business. Although the factory has been in constant operation both day and night since its completion, the Company has been utterly unable to supply the unsolicited orders for its product—which has made it necessary for a further increase in the capacity of the plant. The Peninsular Company enjoys the distinction of having the most modern cement mill in existence.—*Michigan Investor, Detroit, Jan. 1st, 1903.*

BOOM IN CEMENT BUSINESS.—* * * The holders of the stock of the parent company of the Cowham group, The Peninsular Portland Cement Company of this city, are congratulating themselves these days, as the dividend of seven per cent., declared January 1st last, has been followed by a notice of another dividend of seven per cent., to be paid July 1st. The people of this city who invested in cement stock in the days when the business was in absolute infancy and wholly an experiment, are feeling quite pleasant nowadays, as every mill of the Cowham System in operation not only has contracts for its output for a year in advance, but has been turning down all orders for several weeks back, and the reputation of Mr. Cowham as a prophet has not suffered in consequence of the fulfillment of his predictions.—*Jackson Morning Patriot, May 5, 1903.*



It is reported that the earnings of the American Cement Co., ending Nov. 30, 1903, were \$470,144.—*Concrete*.

The Wolverine Portland Cement Company has just declared its dividend, being the third dividend this year.—*Concrete*, Nov. 1905.

The Iola Portland Cement stock has advanced four points since the first of the year.—*Cement and Engineering News*, March, 1906.

There never was a brighter industrial future than that now before American makers of Portland Cement.—*City Engineer Ericson, Chicago, Ill.*

The eastern cement companies are having extremely strong demand for their cement this spring at a considerable increase in price over last year.—*Concrete*, April, 1905.

The Chicago Portland Cement Co. reports a very satisfactory year and contemplates increasing the capacity of its plant to about 75,000 barrels per month.—*Concrete*, December, 1905.

The California Portland Cement Company's sales for September were greater than for any preceding month for the past twelve years.—*Cement and Engineering News*, October, 1905.

The Sandusky Portland Cement Co. has recently declared 6 per cent dividends on both preferred and common stock for the year 1904.—*Cement and Engineering News*, June, 1904.

The Portland Cement Co. located at Portland, Colorado, will double the size of its plant, owing to its having received large orders for cement to be used in the construction of the irrigating canal in Nebraska.—*Cement Age*, Jan., 1906.

The Portland Cement age is just beginning, and those interested have a great era before them in the manufacture of this material that now has such a wonderfully increasing demand.—*Cement and Engineering News*, January, 1902.

LARGE EARNINGS.—The gross business of the American Cement Company at Philadelphia, for the four months ending March 31st, shows an increase of 18 per cent. over the corresponding period of last year. The balance sheet showed a surplus of quick assets over current liabilities of \$243,000.—*Cement and Engineering News*, May, 1900.

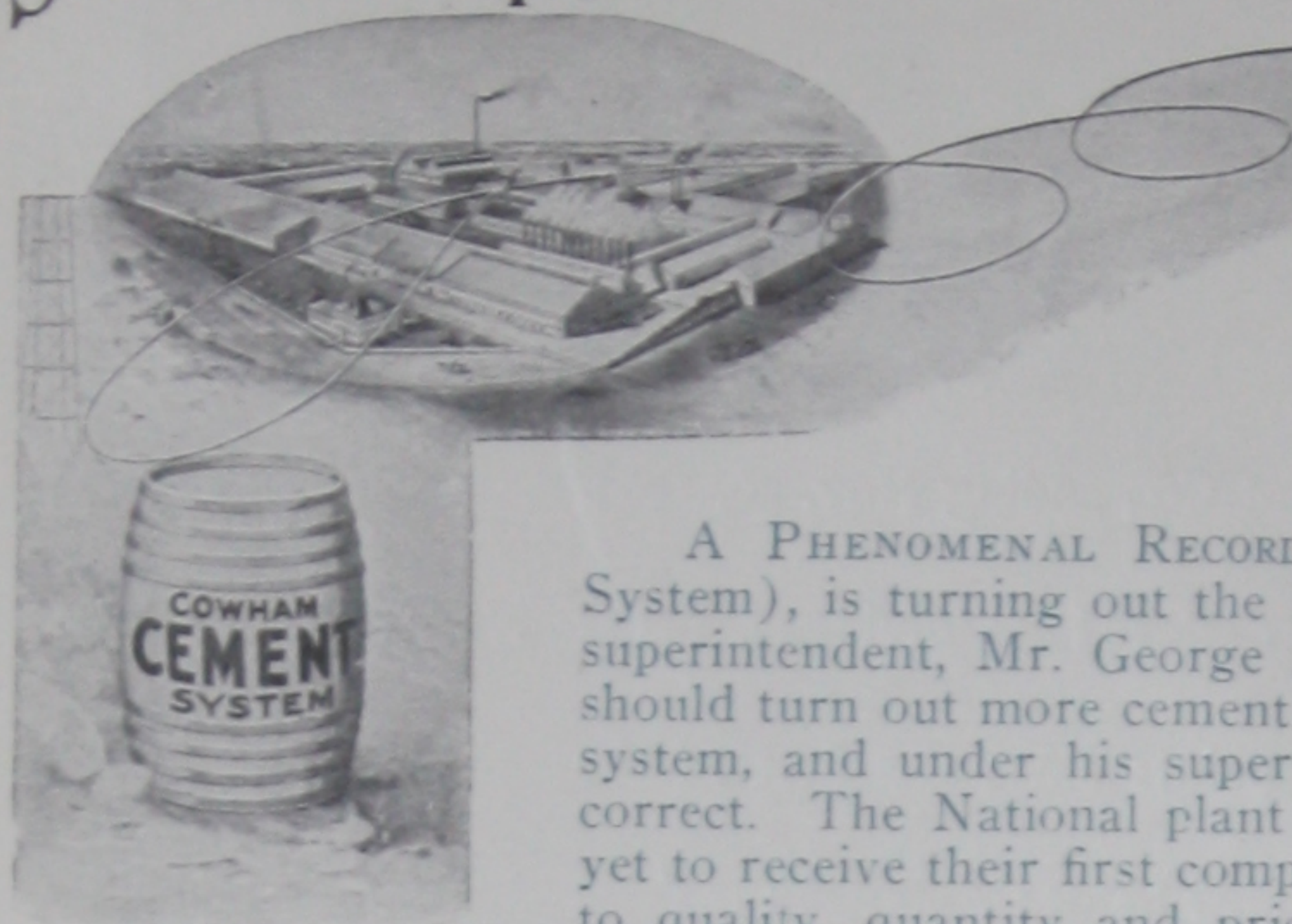
The Pacific Portland Cement Works near Suisun, Cal., has been in operation about two years and from the start the enterprise has been exceptionally successful. Additions are now being built to increase the daily capacity of the plant to 3,200 barrels.—*Concrete*, September, 1904.

Mr. W. J. Budd, of Owen Sound, writes that the different Canadian Portland Cement Companies are experiencing very great activity in their business. Nearly all the companies had a very satisfactory year with better prospects for the coming one.—*Concrete*, April, 1905.

The Wyandotte Portland Cement Co. report a very successful year in their business. The demand has increased to an extent that they are unable to meet, with their present facilities. The company is now enlarging the plant to about three times the present capacity.—*Concrete*, Dec. 1905.

THE PRICE OF CEMENT ADVANCED EIGHTY CENTS PER BARREL.—At the annual meeting of the Helberg Cement Company at Albany, N. Y., Dr. Howard Van Rensselaer was chosen a Director in the place of the late John G. Meyers. The company is doing an enormous business. Their price on cement has advanced over 80 cents a barrel within the past two months.—*Albany Press*.

SOUTHWESTERN STATES PORTLAND CEMENT CO.



A PHENOMENAL RECORD.—The National Portland Cement Company, (Cowham System), is turning out the largest output of any marl cement plant in Canada. The superintendent, Mr. George McGrane, who helped install this plant, maintains that it should turn out more cement than any plant of its size in the world on the wet process system, and under his supervision he has actually demonstrated that his views were correct. The National plant is the leading brand of cement in Canada and they have yet to receive their first complaint as to quality. The outlook for the season of 1906 as to quality, quantity and price is exceptionally bright and the directors are looking forward with anticipation to another profitable year. The bulk of the season's output will be disposed of to regular customers; orders by wire, 'phone and letter are pouring in every day.—*Chronicle*, 4-19-5-3-06.

The directors of the Sandusky Portland Cement Company on April 1, 1902, declared a dividend of 6 per cent. on the preferred stock, payable 1½ per cent April 5, July 1, October 1, and December 31. In June, 1902, they also declared a dividend of 1 per cent on the common stock payable monthly on the 10th of each month from June 10 to December 10, 1902. It is presumed that further dividends will be subject to the action of the directors.—*Cleveland, Ohio, Commercial Bulletin*.

FOURTEEN PER CENT ANNUAL DIVIDEND.—The annual report of the Peninsular Portland Cement Co., (Cowham-McCourtie Organization), was submitted by General Manager W. F. Cowham yesterday, and made even a more satisfactory showing than was anticipated. From the earnings the past year two dividends of 7 per cent each were paid, July 1st, 1903, and January 1st, 1904, still leaving a substantial surplus in the treasury. The unanimity of sentiment manifested was a handsome endorsement of the masterly management of Mr. Cowham, the originator and business head of the great enterprise which has been developed. Prospects of the company for the year 1904 are more favorable than ever.—*Jackson Evening Press*, Jan. 20, 1904.

WOLVERINE PORTLAND CEMENT COMPANY MAKING MONEY—EARNED OVER \$350,000 LAST YEAR.—The Wolverine Portland Cement Co. is in a flourishing condition, according to the reports of insiders. The company has spent \$50,000 in the improvement of its plants during the past year. "It has not only done this," said John T. Holmes yesterday, "but it will soon declare a dividend of between 8 and 10 per cent. It earned over \$350,000 and will have a nice surplus after the dividend is paid."—*Detroit Tribune*, November 26, 1902.

SALE OF BIG CEMENT PLANT.—The biggest cement deal in the history of this industry was consummated to-day in the sale of the plant and property of The Coplay Cement Company. The concern will shortly pass into the hands of the new owners, who are Philadelphia and London capitalists. The syndicate purchased all the stock of the company. The par value of the latter is \$50.00 per share, and on this the company has for some years been paying an annual dividend of 35 per cent.—*Philadelphia (Pa.) Times*, May, 1900.

IOLA PORTLAND CEMENT DECLARES A DIVIDEND.—The directors of the Iola Portland Cement Co. at a meeting held in Chicago declared a dividend of one per cent. a month on the common stock, the first payment to be made in July. The stock of the Company is largely held in Detroit, and has been extremely active recently in anticipation of a dividend on the common. The plant of the Company is located at Iola, Ks., and though the officers are very reticent as to the amount of business being done it is stated that the profits are now exceeding \$100,000 a month.—*Free Press*, June 9, 1903.

OMEGA CEMENT CO.—At the annual meeting of The Omega Cement Company, which is located on the line of the Fort Wayne and Jackson Railroad, about twenty miles south of this city, a splendid showing was made for last year. An 8 per cent. dividend was declared, payable July 1st, and \$40,000 was added to the surplus fund. With stock in store and orders already on the books, the Secretary figures upon an additional \$100,000 in net profit during the balance of the year. It is asserted that every Portland Cement factory in Michigan has already contracted for its output for a year to come at a large advance over the prices that prevailed last year.—*Jackson Evening Press*, April 21, 1903.



SUCCESSFUL BEYOND THE MOST HOPEFUL ANTICIPATIONS.—At the annual meeting of the International Portland Cement Co., (Cowham System), held yesterday great satisfaction was expressed at the success of the company. This was the first annual report of the company submitted and showed net earnings of over 8 per cent for the first five months' operation of the plant, which was remarkable in the face of the many difficulties that had been encountered.—*Ottawa Evening Journal, Feb. 19, 1906.*

A GOOD BUSINESS.—The fire in the plant of Glens Falls Portland Cement Co. on Sunday caused a loss of \$300,000 and threw 500 men out of employment. The Glens Falls Portland Cement Co. was organized 1893, and incorporated under the laws of the State of New York. The company has been doing a very profitable business, and last week its stock sold at \$170.00 for \$100.00 shares.—*Decatur Evening Journal, April, 1900.*

HAVE ENJOYED A PROSPEROUS YEAR.—The financial statement of the Peninsular Portland Cement Co. (Cowham-McCourtie Organization), submitted at the stockholders' meeting held today contained much for the stockholders to be pleased with and the following resolution was unanimously adopted: Resolved, that the stockholders of the Peninsular Portland Cement Co., assembled in annual meeting, hereby express our thanks to President Cowham and the Board of Directors for the successful and profitable manner in which they have conducted the affairs of the Company during the past year.—*Jackson Morning Patriot, Jan. 17, 1906.*

WILL DOUBLE THE CAPACITY.—The annual meeting of the shareholders of the International Portland Cement Co. (Cowham System), was held in Goldsmith's Hall yesterday afternoon. The Directors' report was received with a great deal of satisfaction by every shareholder present. The report showed the company to be in a firm and stable financial condition. A remarkable fact brought out was, that setting aside the time taken in getting the machinery into running order, the factory had only been in operation about 12 months at its normal capacity. During that time its net earnings were equal to over 26% of the capital. As the outcome of the increasing demand for the high-grade "International" brand of cement, and the fact that during the past year orders received by the company were double its ability to fill, the shareholders decided it would be advisable to meet the demand by doubling the capacity of the plant.—*Ottawa Evening Journal, Feb. 20, 1907.*

It is currently reported that the much talked of plant of the Western States Portland Cement Company, recently built by Messrs. Cowham and McCourtie at Independence, Kas., and in which many Jackson people are financially interested, has already proven an immense success. Although the mill was but recently put in commission, and as yet but three-fifths of the plant has been in operation, a net profit of about \$150,000 has already been earned; nearly \$35,000 net for the month of March alone was recorded. As the plant will now soon be running at full capacity, and as prices are just now advancing, occasioned by the beginning of the building season, a phenomenal record is looked for during the very first years' operation of this mill.—*Jackson Citizen Press, April 21, 1906.*

Directors of the Wolverine Portland Cement Company, Coldwater, Michigan, have had mailed to the stockholders checks for the second extra dividend for 5 per cent announced a short time ago, and with the checks is the announcement of a third extra dividend of 5 per cent to be paid November 10, the date upon which the regular quarterly dividend of 1½ per cent will be paid.—*The Cement Era, November, 1906.*

SOUTHWESTERN STATES PORTLAND CEMENT CO.



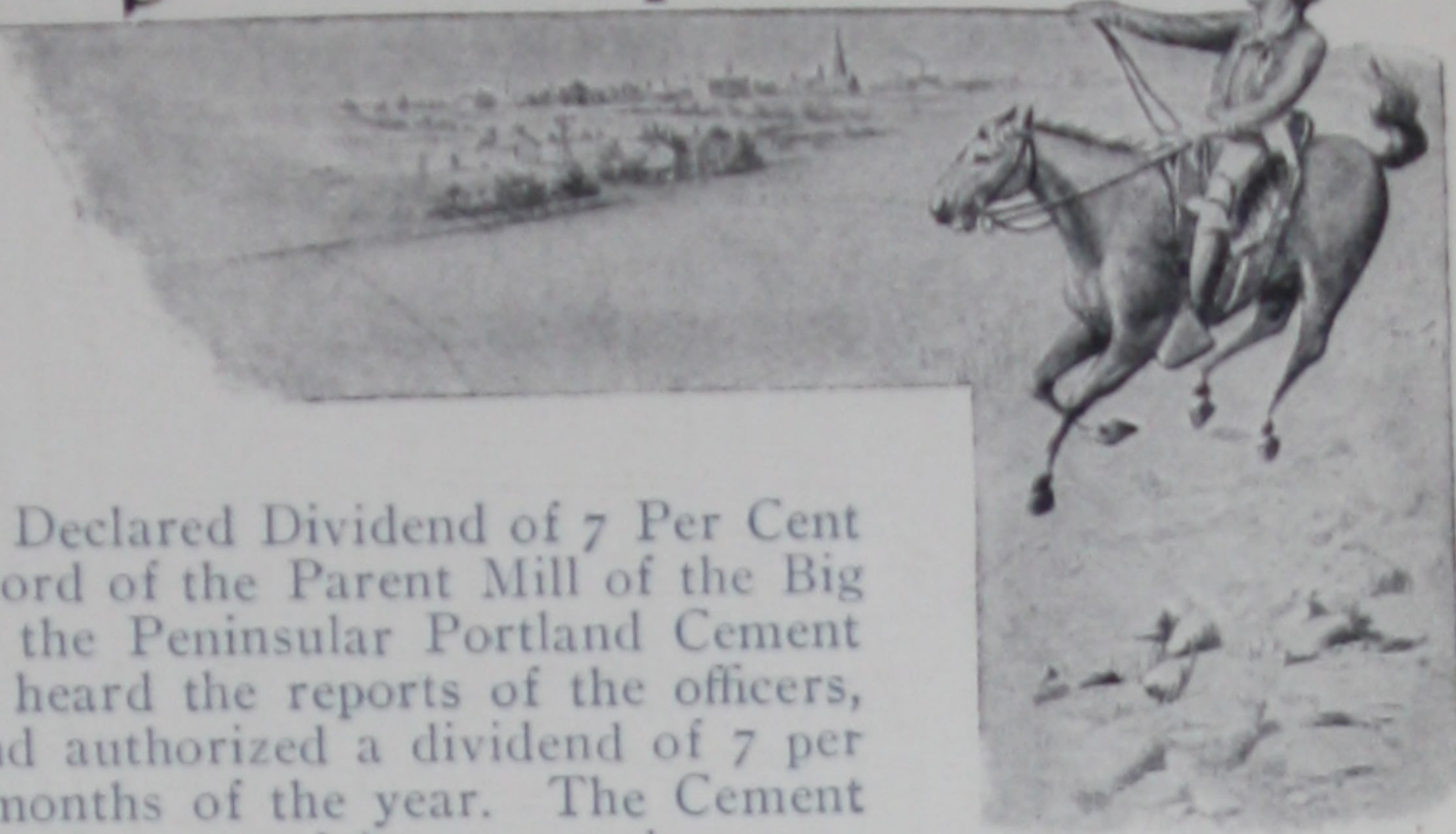
A REAL SUCCESS.—In eight months actual running time, as the facts presented to the shareholders of the National Portland Cement Company, (Cowham System), at their annual meeting held in the Labor Temple Building yesterday proved, the Company has been able to increase the output of its mill very considerably, pay a 10 per cent dividend, and present a handsome surplus. This is doing things.—*Toronto World*, Jan. 22, 1907.

BY THEIR FRUITS YE SHALL KNOW THEM.—Phenomenal Success of the Western States Portland Cement Company.—Mason City people who are intensely interested in the new Northwestern States Portland cement mill being located here will be gratified to know that the "Cowham-McCourtie" crowd have made good at Independence, Kansas, where they have the finest and most successfully operated mill in the world. During the first 6 months of operation of the plant the company has earned and declared dividend of \$210,000. This record has never been equaled or even approached in the history of the cement industry. Like all other business enterprises, they have the detractors and their competitors, but they have so far out-distanced the efforts of others in the Kansas field in the quality of product manufactured, and lowered the cost of manufacture, that the earning capacity of their mill for stockholders exceeds that of any other mill operated in the United States.—*Mason City Times Herald*, June 26, 1906.

THE GERMAN CEMENT INDUSTRY IN 1906.—The past year was favorable for the German cement industry. Thirty of the largest plants representing a capital of \$22,000,000, declared from 10 to 11 per cent dividends. This in the face of heavy imports of cement into Germany amounting in 1906 to 221,449 tons, mostly from Belgium into West Prussia. The Rhenish Westphalian Cement Syndicate at once established sales offices at Cleves, where prices were reduced to meet the Belgium competition which was in a measure successful. **The mills were working on large orders for San Francisco and Valparaiso.**—*Cement and Engineering News*, May, 1907.

THE PROSPEROUS PENINSULAR CO.—Big Earnings Please Stockholders of Peninsular Portland Cement Co., (Cowham-McCourtie Syndicate). Fourteen Per Cent Dividend—Old Officers Highly Complimented and Re-elected at Annual Meeting.—The annual meeting of the Peninsular Portland Cement Company was held in this city yesterday. After calling the meeting to order, President Cowham spoke briefly of the past year's business, which has been a remarkably successful one in the cement industry, and for this company in particular. About two years ago a fire at the company's plant at Cement City did so much damage that a less courageous management might well have been disheartened; but nothing seems to daunt the indomitable and determined management of this most successful company, backed and supported as it is by loyal and confident stockholders. As a result, the company has risen, Phoenix-like, from the ashes and has repaired the damage and nearly doubled the capacity of its plant since the fire, met all its obligations, paid 14 per cent to the stockholders during the past year, and still has surplus and undivided profits of \$222,456.95. To say that the stockholders at the meeting were jubilant is to put it too mildly, for they were enthusiastically so.—*Jackson Morning Patriot*, Jan. 16, 1907.

A GIGANTIC INDUSTRY.—Mammoth Cement Mill of the Western States Portland Cement Company, (Cowham-McCourtie Syndicate) Independence, Kansas, a Marvel in Construction, the Most Modern and Complete Portland Cement Manufacturing Plant in the World—Both from a manufacturing and sales standpoint this plant has already made a phenomenal record. It has produced more than double the quantity of cement under similar conditions of mills of pretended equal capacity. Its product is of the highest quality, already being given the "call" over old established brands and it has reduced its cost of manufacture below that of any other cement mill in the world. The net earnings during the very beginning of the operation of this plant are unparalleled in the history of Portland cement manufacture and the dividend of over \$200,000.00 which has just been declared, still leaving a substantial surplus of net earnings in the treasury, is an unheard of record for a Portland cement mill in operation for so short a time and this plant stands out alone today separate and distinct in a class by itself, the admiration of its owners, a monument to perfect cement manufacture, and the apparent envy of the inexperienced and copyists, and those whose only claim for recognition is cheap construction.—*The Kansas City Star*, June 21, 1906.



PENINSULAR EARNING \$1,000 PER DAY—Directors Declared Dividend of 7 Per Cent from Earnings of Six Months. The Remarkable Record of the Parent Mill of the Big Cowham-McCourtie Organization. The directors of the Peninsular Portland Cement Co. met yesterday at the general offices in this city, heard the reports of the officers, listened to a pleasing recital of profitable business and authorized a dividend of 7 per cent, to be paid out of the earnings of the first six months of the year. The Cement City mill is now coining money for its stockholders at the rate of \$1,000 per day, on a capitalization of \$712,000. Every indication points to a continuation of the same prosperous business, and if nothing untoward happens the mill will pay total dividends for the year in excess of those of last year—14 per cent—besides leaving a handsome surplus in the treasury. The excellent showing made by the Peninsular mill is sufficient tribute to efficient management, thorough knowledge of the cement business gained by years of experience, and high grade executive ability. The cement industry is certainly a great and growing one and a thousand dollars net earnings each business day looks like easy money. But a high grade of skill, combined with practical knowledge of the requirements of the business, location favorable to the markets and raw materials, and expert technical ability, must all combine to bring success. The Peninsular mill has had the benefit of all these conditions, and the result is a great and steadily progressing business—and dividends.—*Jackson Morning Patriot, June 25, 1907.*

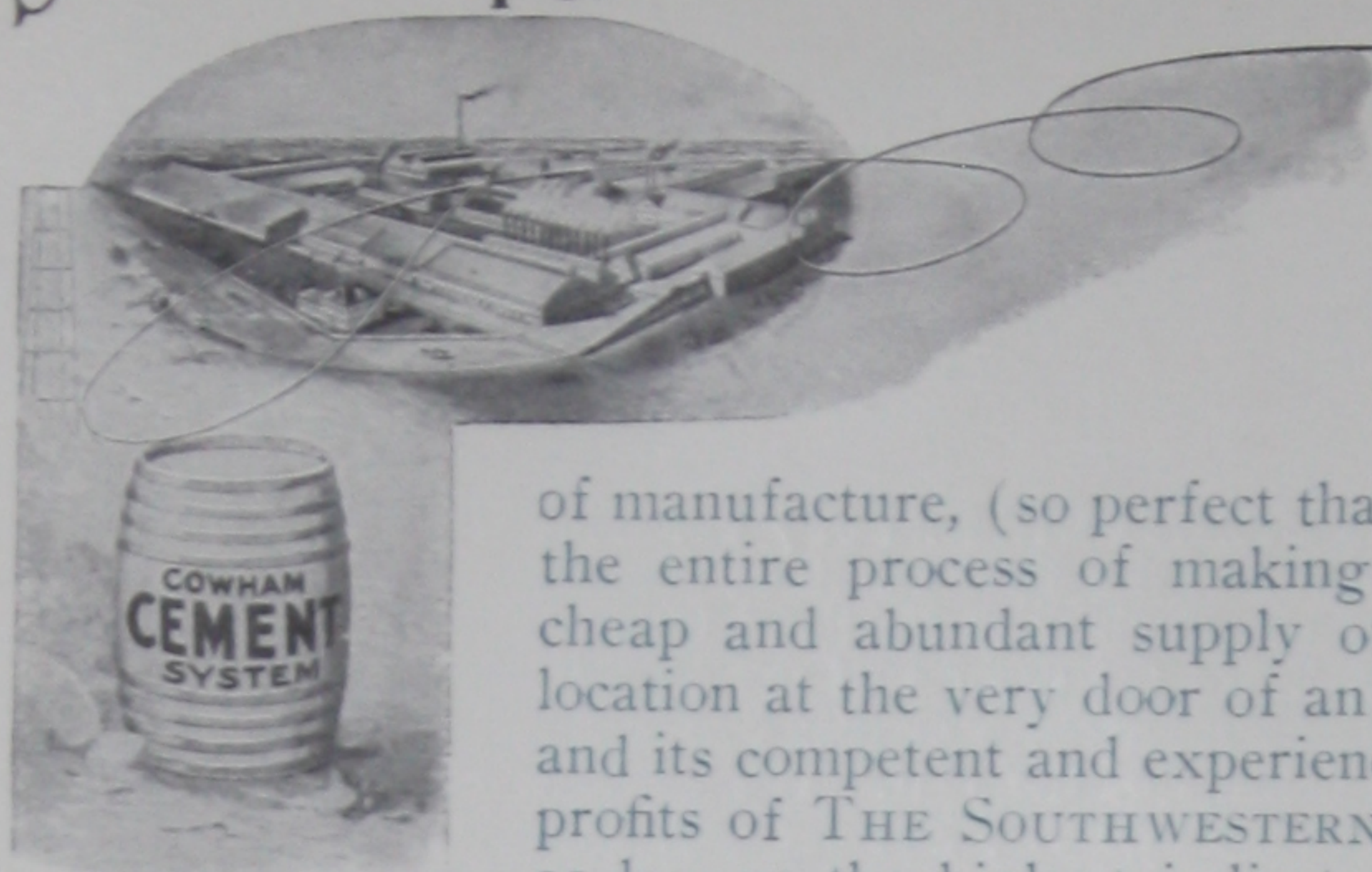
\$205,000.00 ADDITIONAL DIVIDENDS.—Western States Portland Cement Co., Stockholders again on the Payroll. Over \$400,000.00 in dividends distributed by this company in a little over a year—its very first year in business. The splendid success of the Western States Portland Cement Company (Cowham-McCourtie Organization) is again being evidenced by the great influx of dividend checks which are just now being paid at the Citizens National Bank by Mayor Stich, treasurer of this great cement corporation. One year ago, after the plant had been in active operation but six months, the Western States Company declared dividends aggregating over \$200,000.00 and this amount together with the present distribution now aggregates over \$400,000.00 paid to the stockholders of this company during the very beginning of the operation of its plant. It is understood that the net profits of this concern have already reached over 50 per cent of the capital invested in it and as this has been accomplished while the company has been passing through the early stages of its development when it has not only been handicapped by the ordinary disadvantages incident to the establishment of a large business of this nature, but also by an unparalleled car-shortage condition which has prevented the operation of a large part of the plant for several months, the above showing is indeed gratifying to those financially interested in it and marks a world's record for the successful establishment of an industry of this nature. This is indeed a remarkable record and speaks its own credit to the men who are behind the managerial guns. It certainly speaks well for the management of an institution erected at the cost of a million and a half dollars, which can pay a dividend upon its Common Stock at the end of its first year in operation. The figures are like ships that pass in the night; in passing, they tell their own story and set in motion the thoughts of the men who think. Superior construction, intelligent, competent, and experienced management, in addition to judicious location of the project, are the indispensable essentials to the success of a great Portland Cement proposition.—*Independence Daily Reporter, July 9, 1907.*

WOLVERINE PORTLAND CEMENT CO.—The board of directors have authorized the payment of an extra dividend of 5 per cent on the capital stock, payable July 10 to all stockholders of record of July 1, 1907. The transfer books will close July 5 and re-open July 11.—*Detroit Journal, 6-20-07.*

When it is understood that many of the factories referred to are unfavorably located, are hauling their raw materials via rail many miles to the factory, are not equipped with the latest improved methods of manufacture, are burdened with that great item of expense—excessive freight rates in reaching favorable markets—and are also laboring under other serious disadvantages which will not be encountered by the SOUTHWESTERN STATES PORTLAND CEMENT COMPANY, it must certainly appear even to the most criticising and conservative business man that the cost of manufacture by this Company should be greatly reduced, and that it should be able to lay its product down at its market at a total cost and expense that cannot be duplicated by any other factory in the country.

Taking into consideration simply the advantageous location of its raw materials, and estimating the amount actually saved by its improved system

SOUTHWESTERN STATES PORTLAND CEMENT CO.



of manufacture, (so perfect that the raw materials will actually pass through the entire process of making without the agency of human hands), its cheap and abundant supply of fuel, its remarkable shipping facilities, its location at the very door of an ever-growing and locally unsupplied market, and its competent and experienced management, it is impossible to figure the profits of THE SOUTHWESTERN STATES PORTLAND CEMENT COMPANY even as low as the highest indicated by any of the factories mentioned. From the foregoing, and from the most conservative estimates based on the experience of the American cement industry, this Company is entitled to the conclusion that the earnings of its improved plant at Dallas, Texas, should be fully equal, if not far in excess, of any other mill of like capacity in the world.

With its many natural and indestructible advantages, plant of the very best possible mechanical equipment, and competent business management, THE SOUTHWESTERN STATES PORTLAND CEMENT COMPANY is deservedly commanding the attention of the thoughtful, conservative business man and investor.

There is to-day no line of investment that promises larger, more certain, or more permanent returns on capital invested, nor one where the absence of all speculative features is more marked than in connection with the proper and economical production of a high grade Portland Cement.

THIS COMPANY'S OPPORTUNITY

THE SOUTHWESTERN STATES PORTLAND CEMENT COMPANY, in embarking upon this enterprise to manufacture a high-grade Portland Cement to supply this growing demand, has before it the brightest prospects.

There is no element of speculation entering into this project. The natural deposits are absolutely determined both in quality and extent. Soundings, core borings and analysis have told the story unmistakably.

The location cannot be excelled.

Fuel—cheap and abundant.

The markets are extensive and close at hand.

The transportation facilities are the best.

The factory and machinery will be designed, installed, and operated by men of long practical experience in cement making.

By reason of the superior quality of cement which it will produce, this Company will be able to meet the most severe requirements of the railroad, municipal and government engineers, and on account of the large capacity of its mills, it will be further enabled to take on the large contracts, which are both desirable and profitable.

This Company is also extremely fortunate in having that no less important factor of success, the competent and expert business management of men thoroughly familiar with every detail of the cement business.

There is no prospecting or experimenting to be done; no chance to be taken.

The success of the enterprise is assured.



ORGANIZATION AND FINANCIAL PLAN

THIS Company is organized in connection with and for the development of the valuable deposits, described in the foregoing, located near Dallas, Texas, and it is the purpose of the Company to immediately erect and put into operation at this point the best, the most complete, and one of the largest Portland Cement mills in the country.

The basis of organization is such that \$1,750,000 of 7 per cent Preferred Stock and \$1,750,000 of Common Stock is the total capitalization of the Company.

All the stock of the Company is issued fully paid, and non-assessable.

The Company will issue its 7 per cent Preferred Stock as ordered from time to time by the Board of Directors.

The Preferred Stock as provided in the certificate, "is entitled to a fixed dividend of seven per cent per annum from July 1st, 1908, or subsequent date of issue, and cumulative until said shares of stock are called for redemption: the whole or any part thereof being redeemable by said Company at its par value with unpaid dividends at any time on or after July 1st, 1913, said redemption to be made at the time fixed for payment of any annual dividend. The preference as to stock and dividends extends to the assets as well as to the earnings of said Company."

"The voting power of the Preferred shall equal that of the Common Stock, share for share."

With each share of Preferred Stock one-half share of Common Stock is given as a bonus, the remainder of the Common Stock being reserved for the promoters; therefore whenever the Preferred Stock is retired the subscribers thereto will have received their principal, plus 7 per cent annual dividends, and still hold Common Stock representing a one-half ownership of all the assets of the Company. The purchasers of Preferred Stock are thus also given control of the affairs of the Company until the Preferred Stock is paid in full and retired.

Dividends on Common Shares will be declared as warranted by the earnings, after making required provisions for Preferred shares, and provision for such extensions of mills and business as may, in the judgment of the Board of Directors, be of advantage.

The proceeds of the Preferred Stock is estimated to be ample and sufficient to cover all expenses of constructing and equipping, with all necessary appliances, cement mills with a daily capacity of 2,500 barrels, and also to provide a working capital.

The management will be under the control of experienced cement manufacturers and men well known in financial and business circles, whose connection with the enterprise establishes its position and assures its success.



W F COWHAM PRES
C F ANDREWS V PRES

J W SHOVE SECY
A STEINMETZ ASST SECY

A C STICH TREAS
N S POTTER ASST TREAS

WESTERN STATES PORTLAND CEMENT CO.

ADDRESS ALL BUSINESS COMMUNICATIONS TO THE COMPANY

INDEPENDENCE, KANS. May 27, 1907.

W.H.L. McCourtie, Sec'y.,
Southwestern States Portland Cement Co.,
Minneapolis, Minn.

Dear Sir:-

After a thorough and exhaustive examination of the cement materials owned by the Southwestern States Portland Cement Company at Dallas, Texas, I have to report that my investigations show them to be most excellent in every respect.

The rock covers a large area to a great depth and is therefore practically inexhaustible. It is soft, drills and blasts easily and comes to the surface at nearly all points, the small amount of loose earth found in places being merely disintegrated limestone having no deleterious properties. The shale, lying directly under the limestone in unlimited quantity, is of exceedingly uniform composition, requires little or no drying and pulverizes with extreme readiness.

The location of these materials in a series of low bluffs, affords an excellent opportunity for their transportation by gravity to the broad, splendidly drained plateau that is in every way an ideal location for a mill.

The following are representative analyses of a large number of samples taken at varying depths from different parts of the property, the third column showing composition of the cement resulting from a proper combination of the materials.

		Limestone	Shale	Cement
Silica	SiO	4.11	59.75	21.27
Alumina	AlO	2.77	21.08	9.15
Oxide of iron	FeO	.90	4.87	2.44
Lime	CaO	91.05	Carbonate	2.50
Magnesia	Mgo	.58	.67	.90

The above analyses show that from these materials, mixed in accordance with chemical laws and carried through the various processes of manufacture by approved modern machinery under the supervision of cement experts, there can be produced a Portland Cement unsurpassed by any in the world.

In the course of my work as a cement expert I have had occasion to examine a large number of cement propositions and have been obliged to report unfavorably upon most of them, but in all my experience I have never had the pleasure of examining materials better suited for the manufacture of a high grade Portland Cement than those of your Company at Dallas, and I congratulate you accordingly on possessing probably one of the best deposits of raw materials in existence. During the past year, in connection with the prospectors and specialists of the Cowham-McCourtie Cement Organization, I have visited many prospective locations in different sections of the United States and Canada, and feel no hesitancy in saying that you have at Dallas, Texas, one of the best Portland Cement propositions on the American continent.

Yours very truly,

B.S.
Director of the Laboratory.



NO CEMENT IN TEXAS

* * *

GREAT SCARCITY OF CEMENT.

Contractors Say Not a Half Dozen Sacks are Available for Sidewalks. Work is Delayed.

Contractors declare that there is not in the city a half-dozen sacks of cement available for use in building sidewalks. The sidewalk building crusade, it is declared, has been temporarily delayed on this account and the scarcity of cement has also stopped the concrete work on the South Ervay street paving.

Sidewalk Inspector W. E. Parry said yesterday that because of the shortage of cement the work of building sidewalks has practically stopped.

No reason is assigned for the scarcity of this material.

From the Dallas Morning News of April 29, 1907.

According to report the price of cement has increased about thirty per cent in the last few months and still the demand is larger than the supply. Why not have a few cement works for Dallas?

From the Dallas Daily Times-Herald, April 15, 1907.

PAVING WORK IS DELAYED.

Improvements Are Temporarily Retarded from Various Causes—
New Rails for Forest Ave.

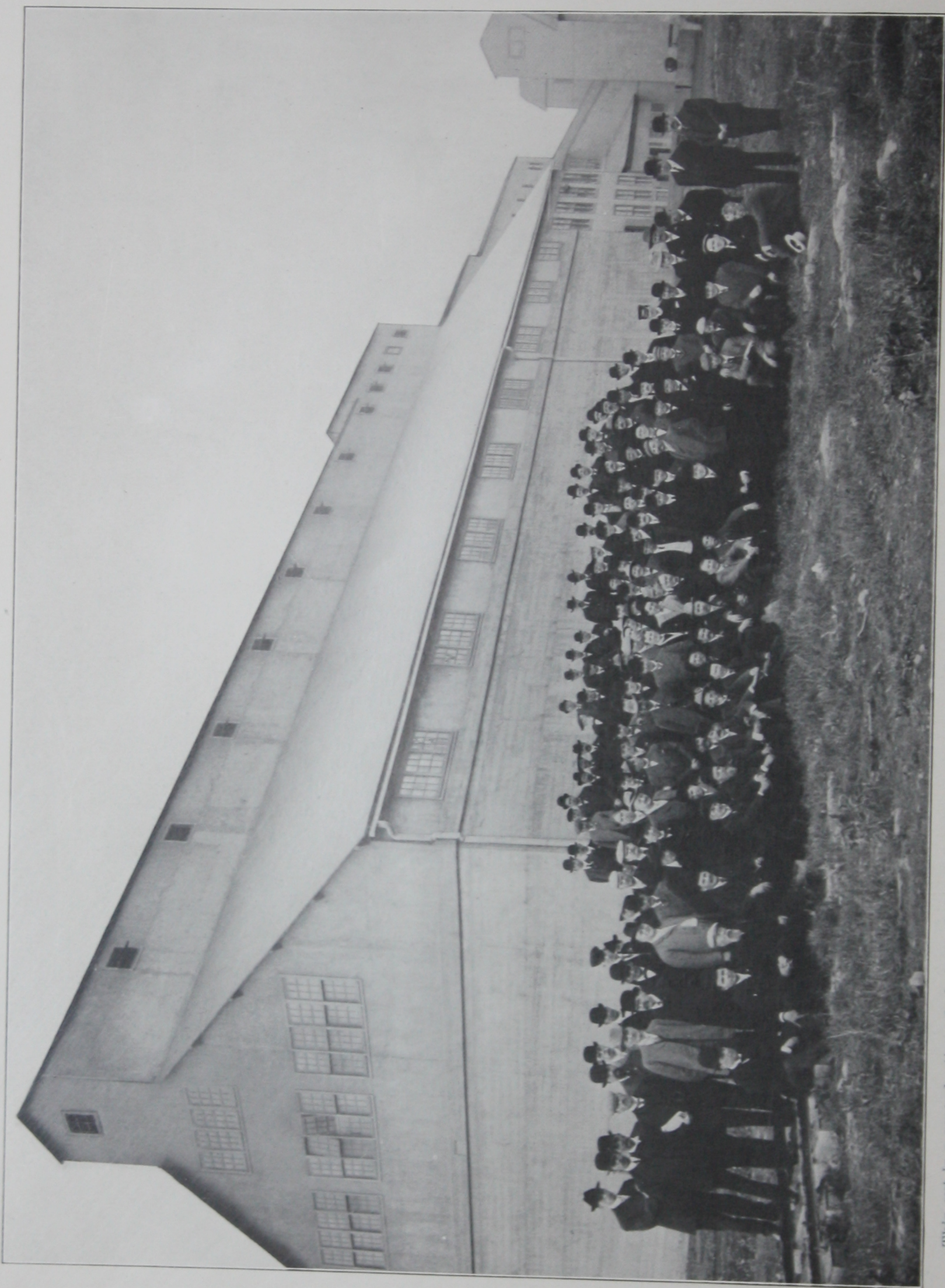
A large force of men is engaged in the work on Forest avenue. This is being temporarily retarded because the street railway company is laying double tracks from beyond Gould street and the concrete workers are waiting for the new track to be sent ahead of them. Ervay street is being delayed because of scarcity of cement which goes into the foundation. When this comes the work will be a matter of but a few days.

From the Dallas Morning News, Friday, April 26, 1907.

* * *

What we want is more cement and a better grade than that which has been turned out recently.

From The Dallas Dispatch, Monday Morning, April 1, 1907.



This cut is a reproduction of photograph taken beside the hopper bottom concrete clay storage building at the great works of the Western States Portland Cement Company at Independence, Kansas, on May 2nd, 1906. Included in the party are many bankers, lumbermen and representative business men of Minnesota and Iowa, who assembled for the purpose of investigating the mammoth plant of the Western States Portland Cement Company, and in this manner secure a tangible idea of the magnitude and superior class of equipment, and see for themselves the very best there is in Portland Cement manufacture.

Kansas City, Mo., May 2nd, 1906.

Northwestern States Portland Cement Co.,

Mason City, Iowa.

Gentlemen:-

Having taken advantage of the opportunity to visit and make a personal inspection and thorough investigation of the mammoth works of the Western States Portland Cement Co. located at Independence, Kansas, which plant bears the reputation of being one of the finest cement mills in the world and a duplicate of which it is proposed to construct at Mason City, Ia., we beg to make the following report for the benefit of others who may desire to become interested in your company:

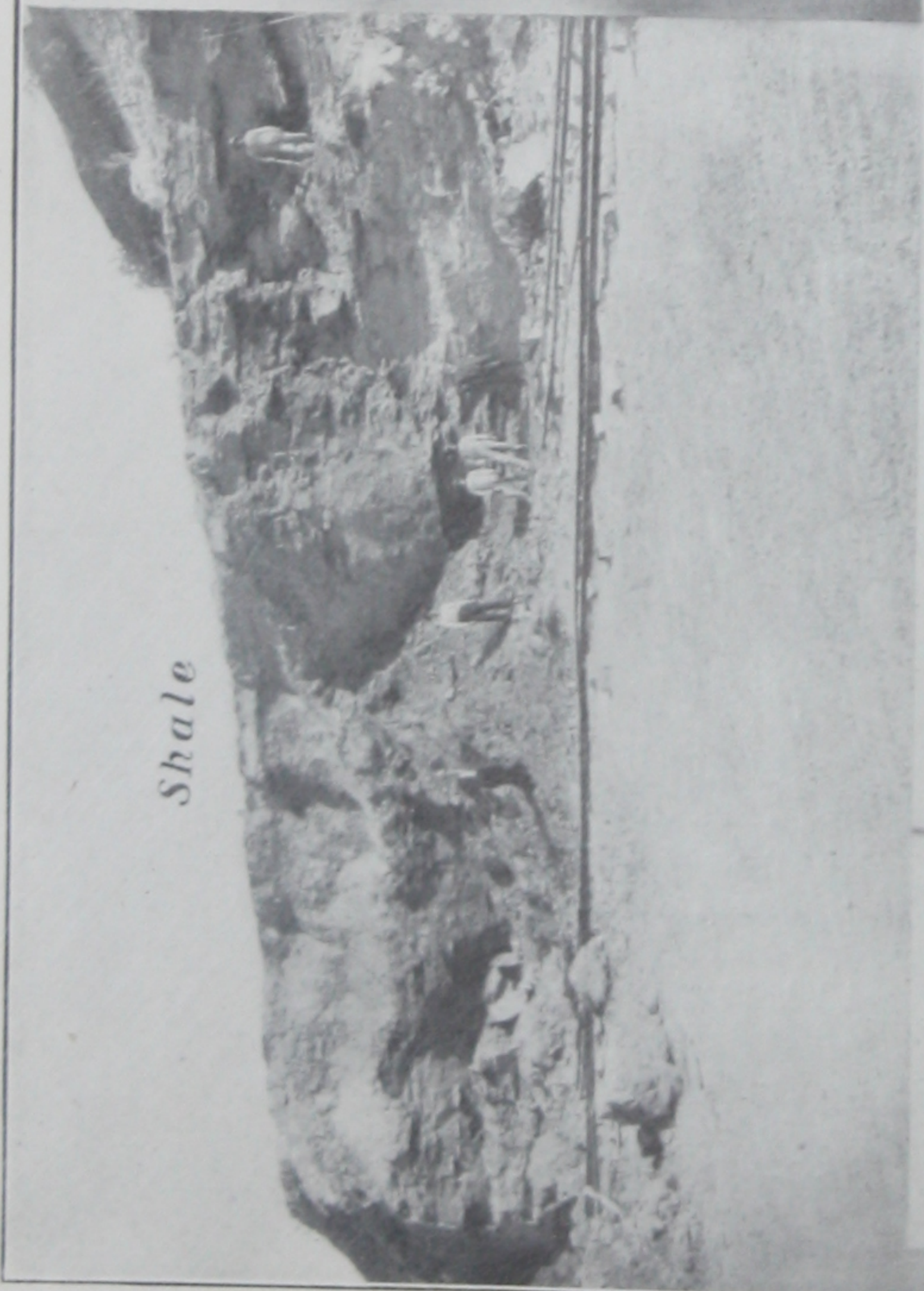
The magnitude and extent of the plant is surprising and startling. It is modern in every detail, built most substantially throughout, and while its estimated capacity was 2,500 bbls. per day, we are informed its possible working capacity is considerably more than that amount. The factory buildings, concrete steel structures throughout making them absolutely fire proof, together with the necessary out-buildings cover an area of about 25 acres of land, and are models of convenience, perfectly arranged and are equipped with the strongest and best types of machinery, specially designed for this plant. The entire equipment certainly bears evidence of being the finest product of the best mechanical and engineering skill now engaged in that line of work and we are informed and believe from what we know of the business, the machinery and equipment throughout in this mill to be of better design, more substantial and superior in every detail to that ever before installed in a cement plant. The whole works are propelled by electric motors, situated in convenient places throughout the plant, and the mill is lighted inside and out by electricity.

A notable feature is the double system installed throughout the entire plant. Everything seems to be so arranged as to avoid any possibility of a complete shut down -- duplicate machinery being installed throughout, to be used in case of accident and repairs and by reason of which it appears quite possible for a plant of this design to operate every day in the year. We find that these works are so designed and constructed that the machinery practically takes the raw materials from their natural resting places and carries them through the entire process of manufacture, converting them into high grade Portland Cement at the mouth of the barrel or sack in which it is to be shipped without the aid of human hands.

The whole factory is a model of beauty and stability, it is not built temporarily, but permanently and for all time, and is being most perfectly, successfully, and profitably operated by master hands, and is without doubt the most modern and best equipped cement plant in existence. Those interested in your company can surely congratulate themselves upon having located at Mason City such a model factory for this new, growing and substantial industry and a plant which we believe will produce the finest possible quality of Portland Cement at a minimum cost.

Very truly yours,

The above is a reproduction of letter signed by each individual member of the investigating party shown in photograph on opposite page. This letter was tendered by unanimous resolution and presented as a handsome endorsement of the superior class of equipment installed in the "Cowham System" of Portland Cement Mills.



Shale



Shale



Rock



Shale

Rock

From these illustrations may readily be seen the excellent physical properties of the materials and the almost total absence of any overburden of alluvial soil. The rock is soft and dry, drills easily and when blasted shatters along both horizontal and vertical lines into small cubes conveniently handled. The shale is unusually uniform in composition, requires little or no drying and pulverizes with extreme readiness. Clay shale is composed chiefly of decomposed orthoclase feldspar, whose composition is aluminum silicate. To this is added other decomposed rocks, which taken together forms what is generally called clay. The nature and composition of the clay shale depends on the amount and kind of decomposed rocks contained in them. Portland Cement requires in its successful manufacture a clay shale having a certain chemical composition to go with the limestone, viz., high in "soluble" silica, certain relative percentages of iron oxide and alumina, low in magnesia and sulphuric acid and free from the feature of a high grade Portland Cement. In all these particulars the Company's immense deposit of clay shale is admirably suited to the cement business.

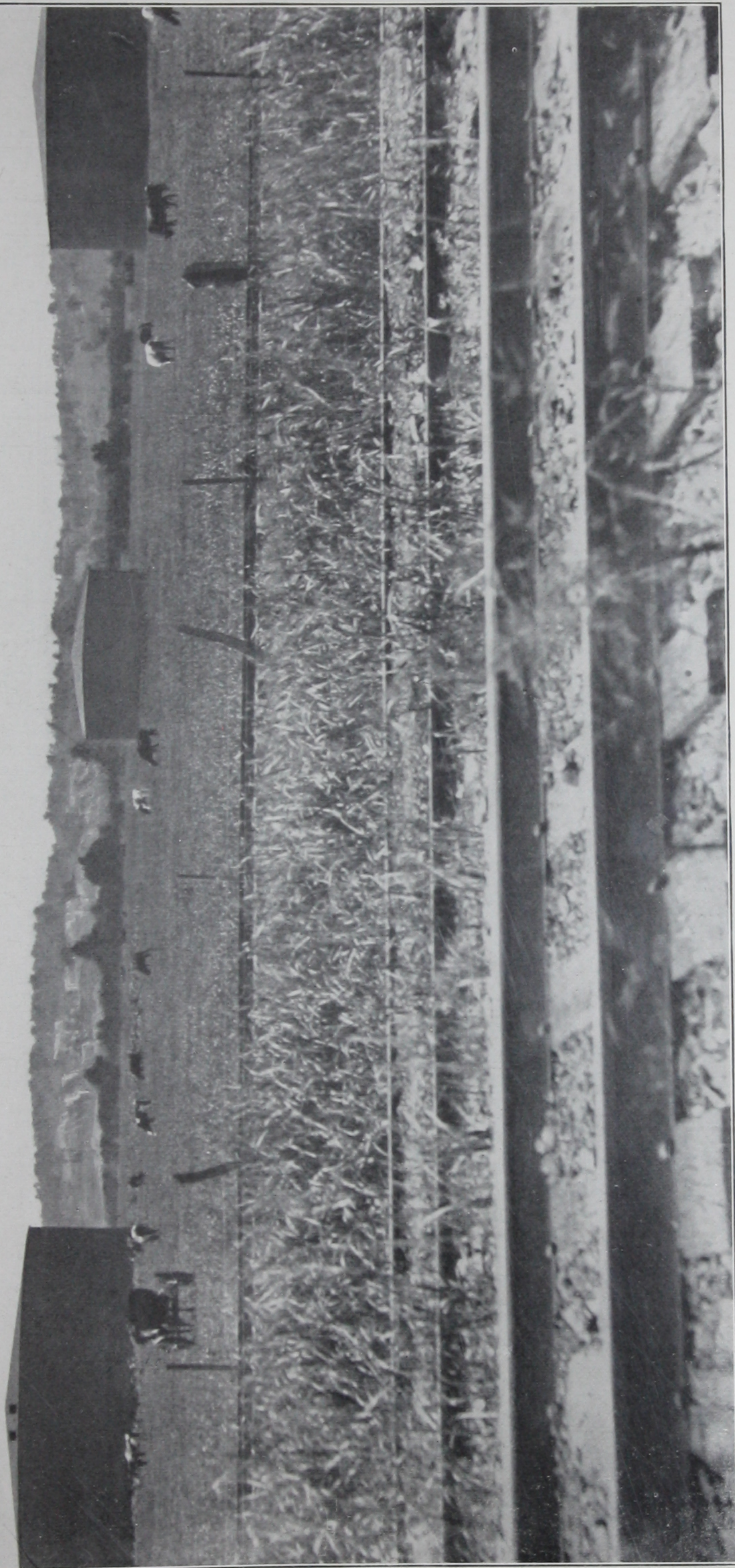
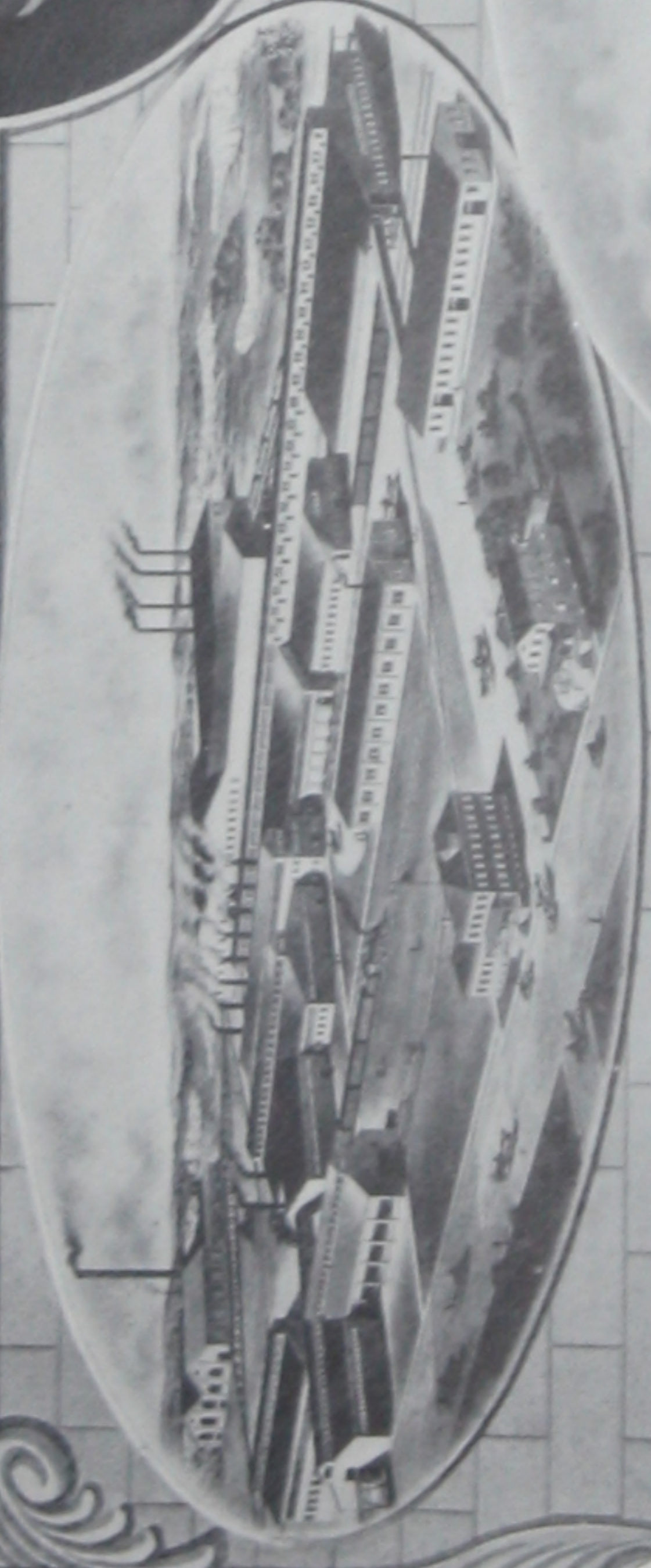


Illustration from photographic view showing the Texas and Pacific and Texas Northern Railways, the Oil Tank Farm of the Texas Company and the splendid location of the Southwestern States Portland Cement Company's property taking in the foot-hills beyond, and giving an idea of the excellent shipping facilities and convenient fuel supply. The mill site, being located on a broad, well drained, gradually sloping plain, directly at the base of the series of low hills containing both the rock and shale for cement manufacture, affords an excellent opportunity to employ the gravity system for the convenient and economical handling of these materials.

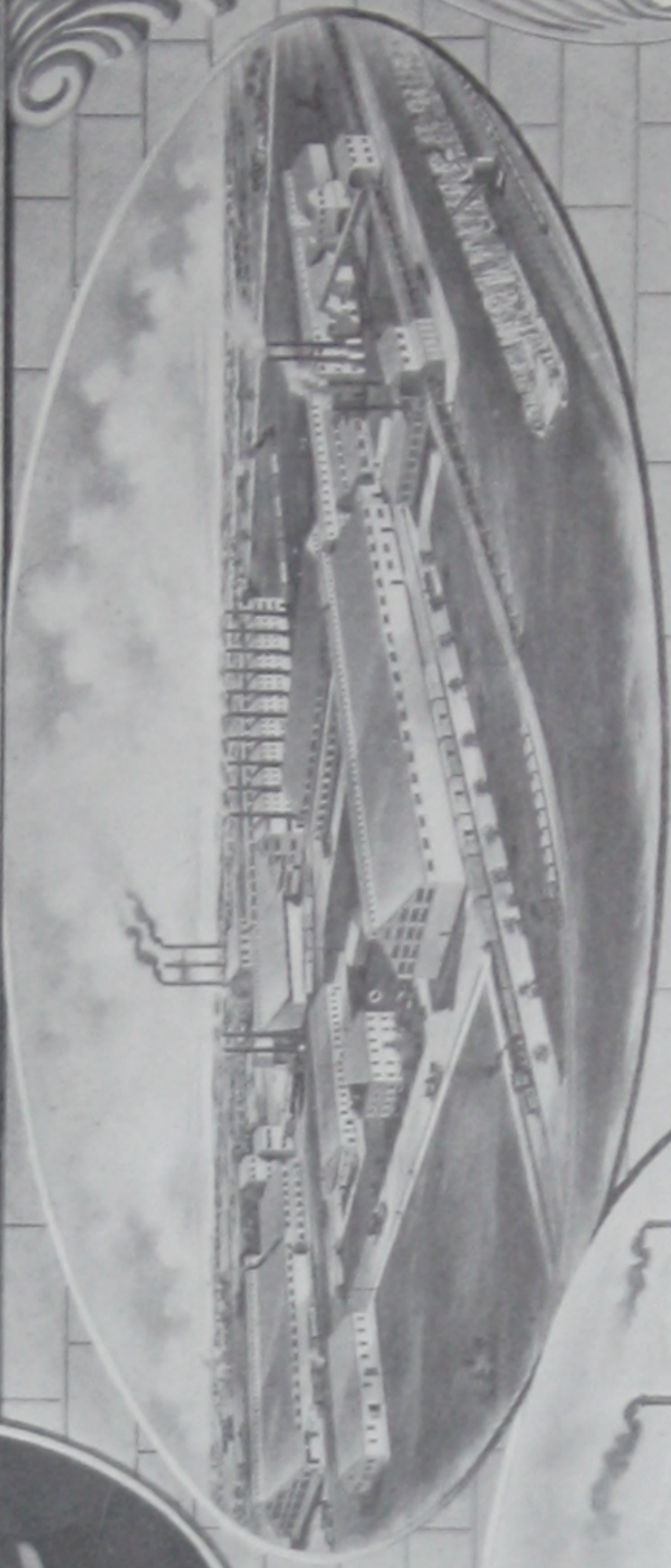



W. H. COWHAM, PRESIDENT

W. H. COWHAM, SECRETARY



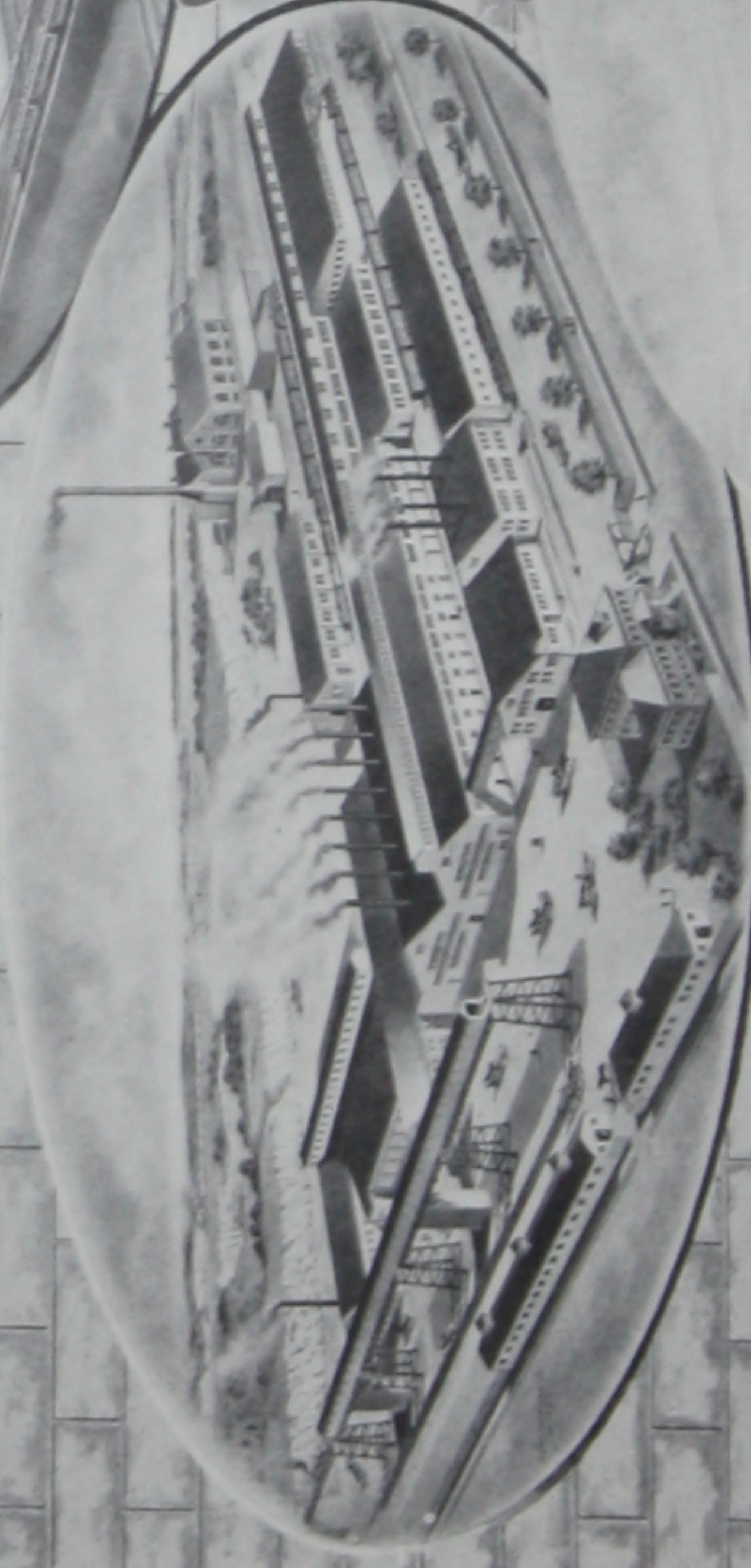
SOUTHERN STATES PLANT



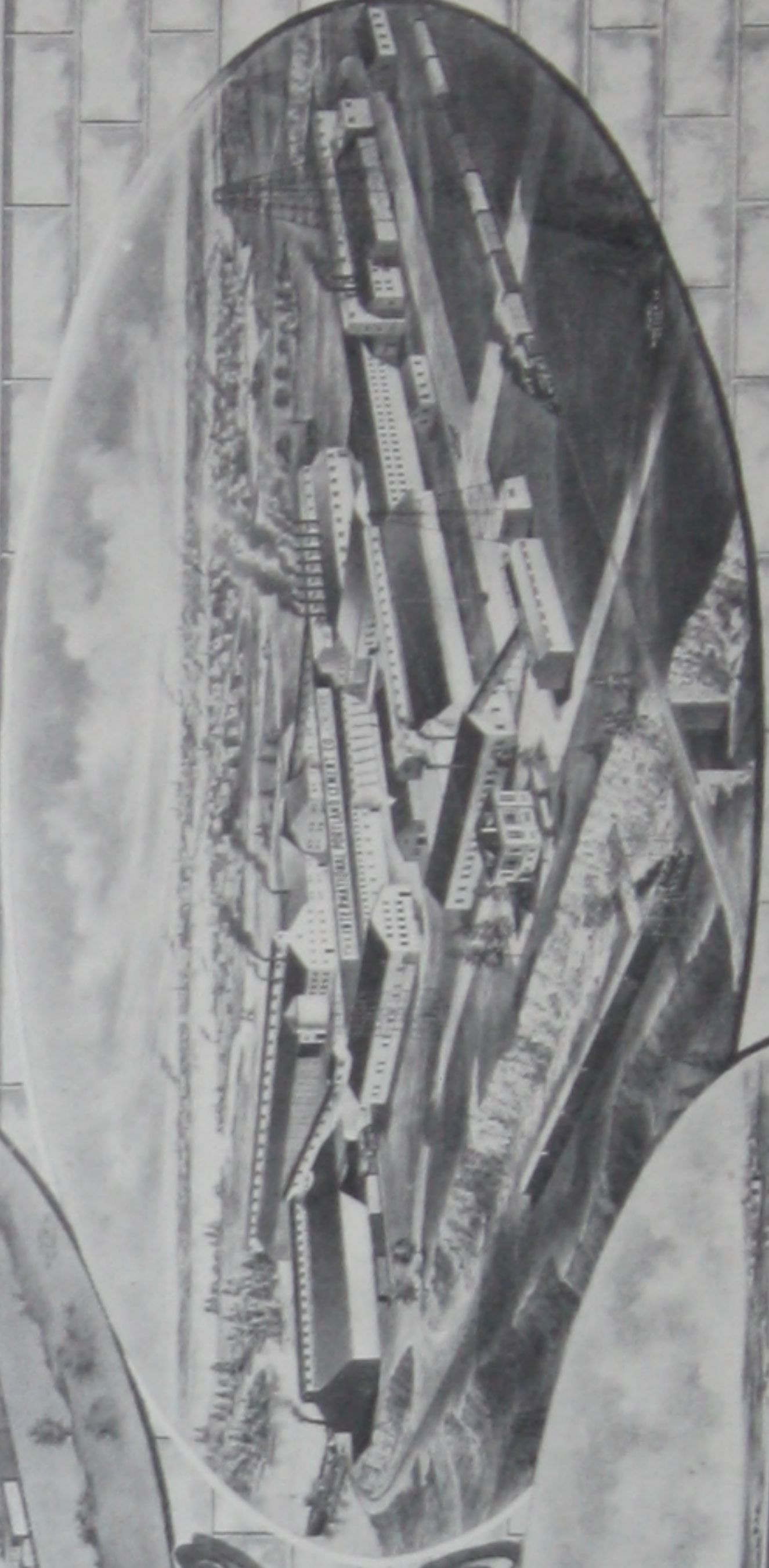
WESTERN STATES PLANT



PENINSULAR
PLANT
PARENT
MILL



NATIONAL PLANT.



INTERNATIONAL PLANT



NORTHWESTERN STATES PLANT



Cowham System of Mills Core-Boring Machine in Operation.

Securing samples of raw material at various depths, for chemical analysis. By this method the extent and uniform quality of the raw materials are absolutely determined.



Bird's-Eye View of the great works of the Peninsular Portland Cement Company.

The parent factory of the Cowham system of Portland Cement mills—strongest organization for the manufacture and sale of high grade Portland Cement in America. The record of this plant is unparalleled in the history of the Portland Cement industry.

HORD
WHITEHEAD & CO.
DETROIT

PENINSULAR

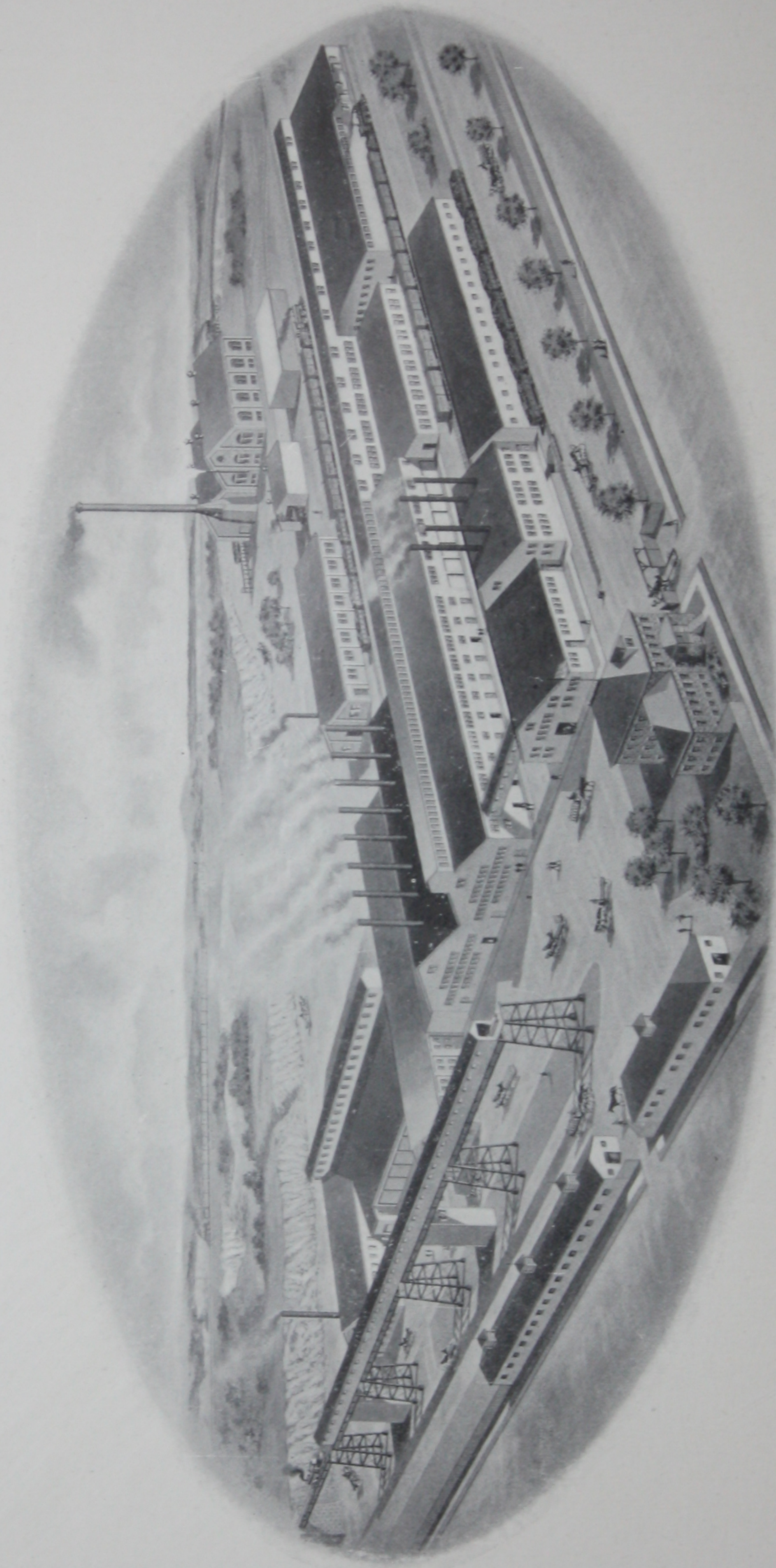
WORLD'S GREATEST CEMENT FACTORY.

(From the Daily Patriot, Jackson, Mich., December 28, 1902)

THE plant of the Peninsular Portland Cement Co., of this city, is recognized to be the most modern and best equipped Portland Cement factory in the world, and the results of its operations have more than justified every prediction of its designers and builders. From the day when the wheels were first put in motion, the mill has not shut down one minute while the raw material, by this latest system of cement making has, day and night, been taken from its natural resting place and carried through the intricate process of cement making until it fell into the bins in the form of commercial cement, all without the agency of human hands. Days, nights and Sundays it has run to its fullest capacity, veritably coining dollars out of raw materials which were long supposed to be worse than useless, and it has been utterly unable to fill the orders which have come to it unsolicited.

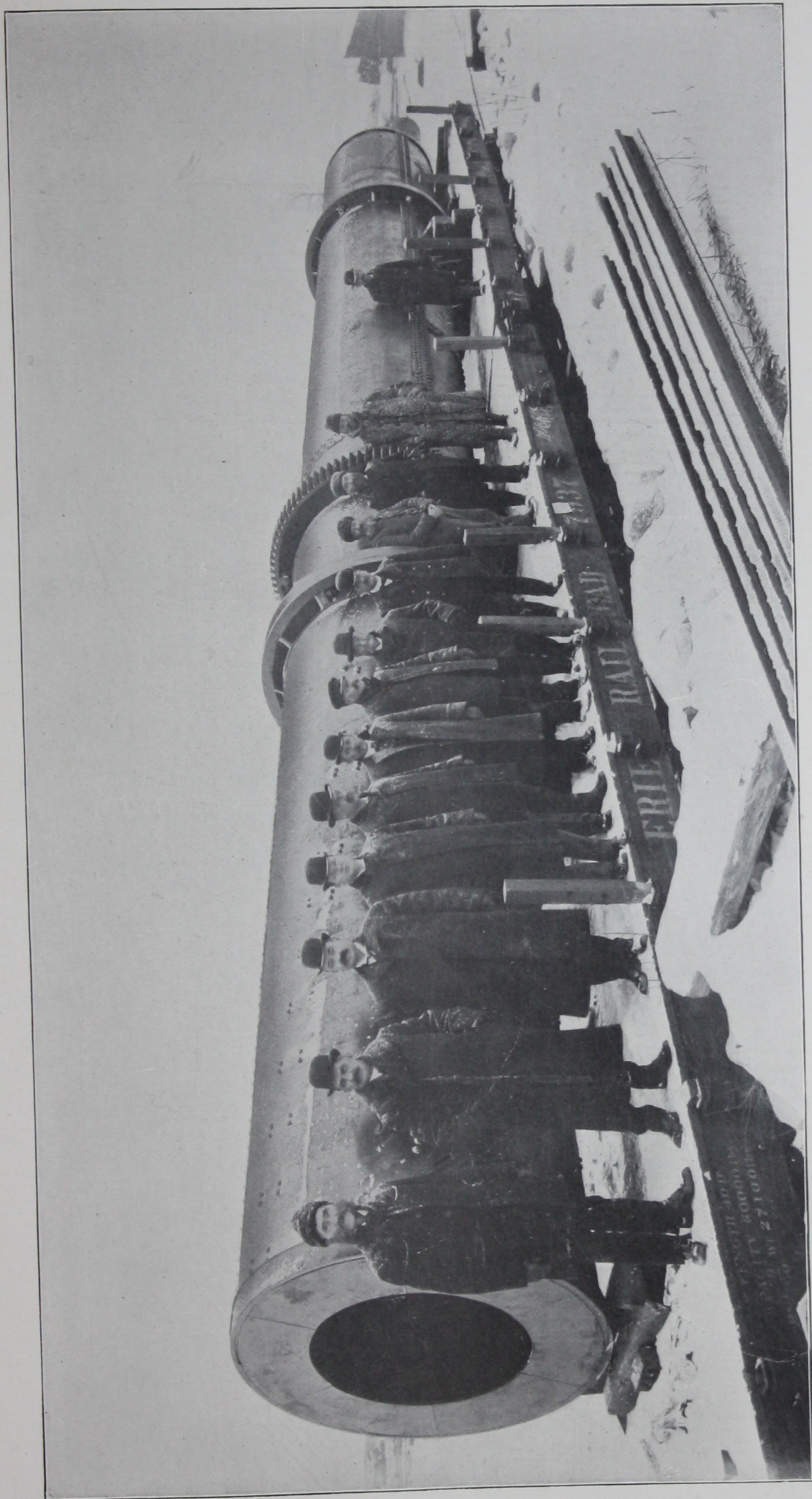
The fact that not a sack of this cement, to say nothing of a carload, has ever been rejected or returned, and that the Cement City mill, with its superior process of manufacture, is utterly unable to fill its orders, demonstrates better than any words could the success of the project which is of so much importance to this city. It is a monument to the excellent judgment of the gentlemen who originated this enterprise.

The Portland Cement industry has passed the experimental stages, and the great success of the enterprise at Cement City, demonstrates beyond question that the industry should be founded on strong financial lines, and that the selection of raw materials, and the designing, building and operating of Portland Cement factories should be intrusted *only* to men of unquestionable ability, and practical experience in cement making.



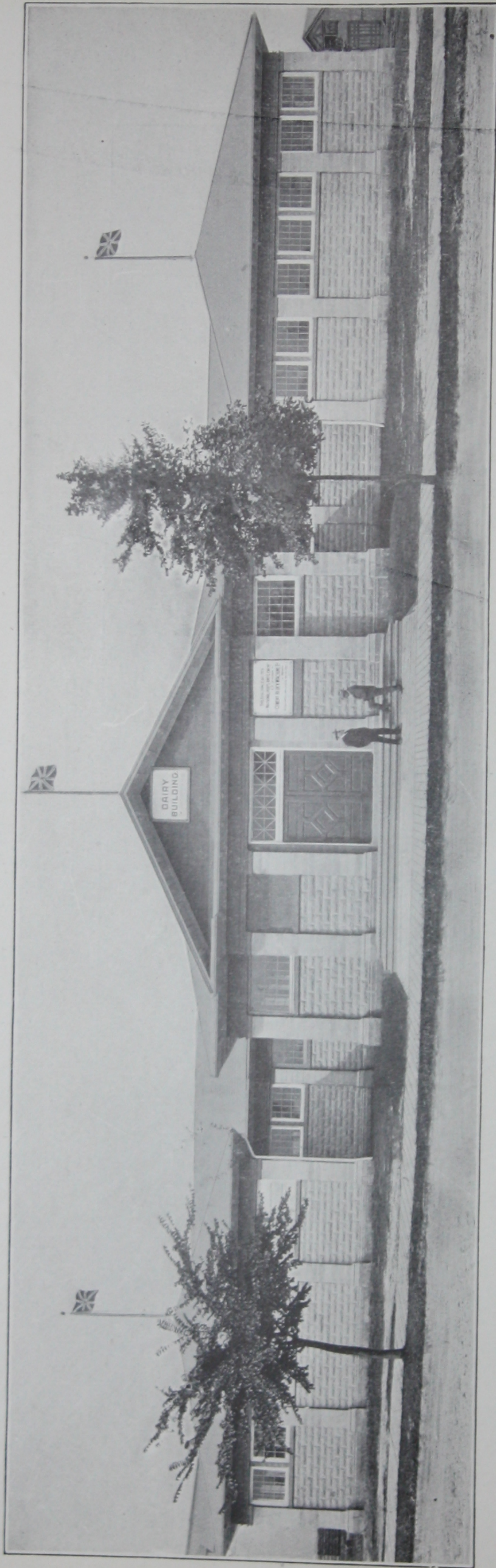
Great Plant of the National Portland Cement Company.
(Cowham System)

Experts concede it to be the very latest improved and best equipped Portland Cement factory in America. It must be seen to be appreciated.



IMPROVED ROTARY KILN.

The above cut is from a photograph of one of the Mammoth Rotary Kilns now installed and operating in the great Works of the "Cowham System." This Rotary is of special design and is conceded by experts to be the crowning effort of engineering skill. The Rotaries to be used in the plant of The Southwestern States Portland Cement Co., Dallas, Texas, will be of the same type, designed and installed under the supervision of the same staff of expert cement engineers.



New Dairy Building, Toronto Industrial Exhibition, Toronto, Ont.

Constructed by The National Portland Cement Company.

(COWHAM SYSTEM)

"I believe that this is the best building for dairy exhibition purposes to be found anywhere in the world; and I say this after having been in all the prominent buildings erected for the purpose on this continent, and with a fair knowledge of similar buildings in the Old Country."

J. A. RUBBICK,

*Chief of the Dairy Division of the Department of Agriculture
for the Dominion of Canada.*

"The dairy Building is a splendid object lesson, and the finest building of its kind in America."

PROF. ROBERTSON,

Commissioner of Agriculture for the Dominion of Canada.





The National Portland Cement Co.,
Toronto,
Ont.

Dear Sirs,

On behalf of the Directors of the Toronto Industrial-Exhibition, we beg to convey to you a high appreciation of the splendid work your company has performed in the erection of our new Dairy Building. Knowing as we do the almost insurmountable obstacles which you had to overcome in erecting this building, we feel that it would be unjust on our part did we not convey to you our high sense of the obligation under which you have placed our Association.

You will hear from our Secretary later on that we have awarded your company a gold medal as a slight recognition of its services, as well as to the excellence of the construction of the building for which you have the contract.

Wishing your company a long and prosperous career and trusting that the beautiful building that you have erected upon our grounds may long remain as a living advertisement of your powers of manufacturing artificial stone.

I am with best wishes.

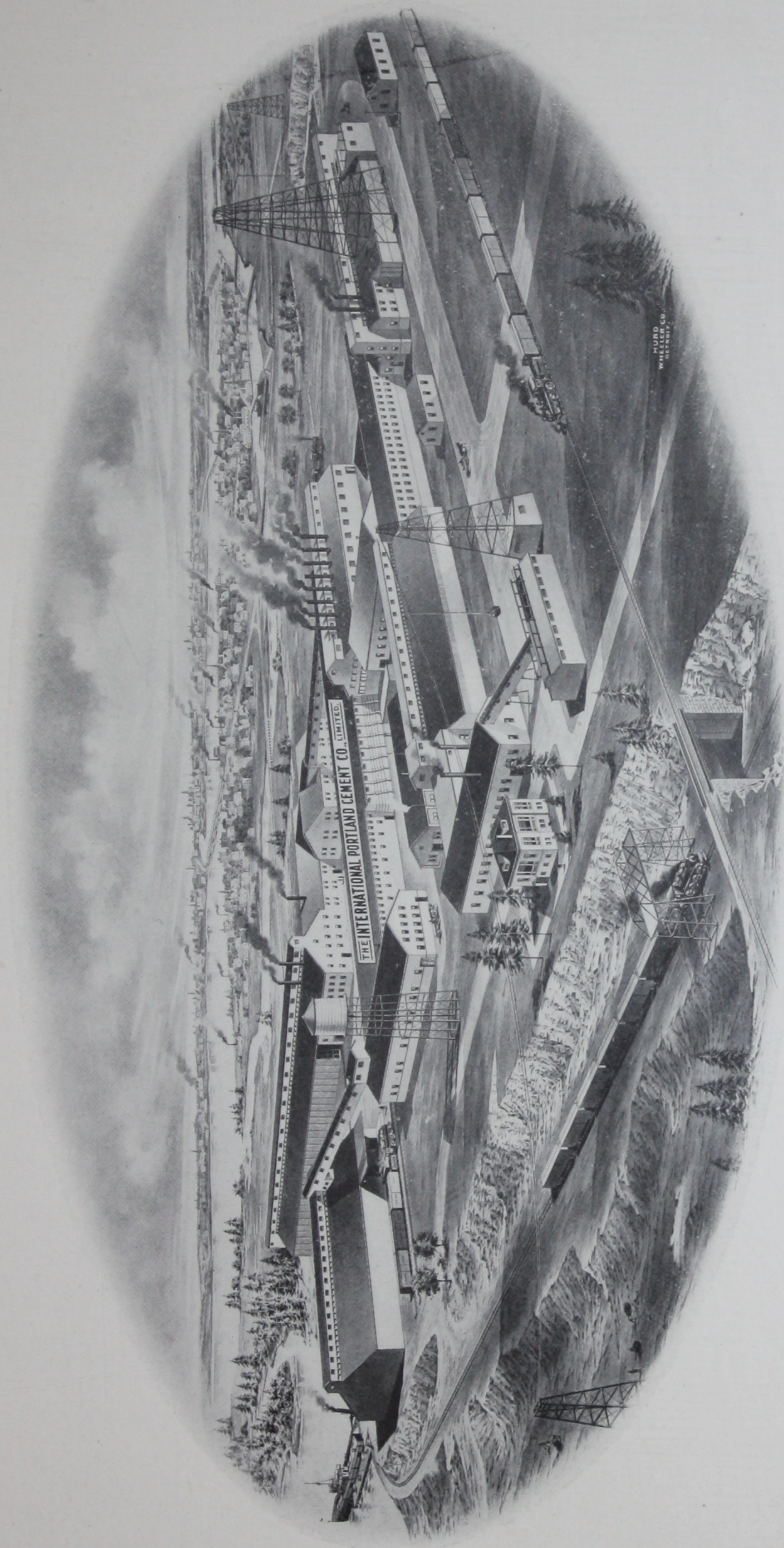
Very truly yours,

W. H. Vaught
President.



The Magnificent Plant of the Southern States Portland Cement Company.
(Cowham System)

This plant is of the very latest design and equipment throughout.

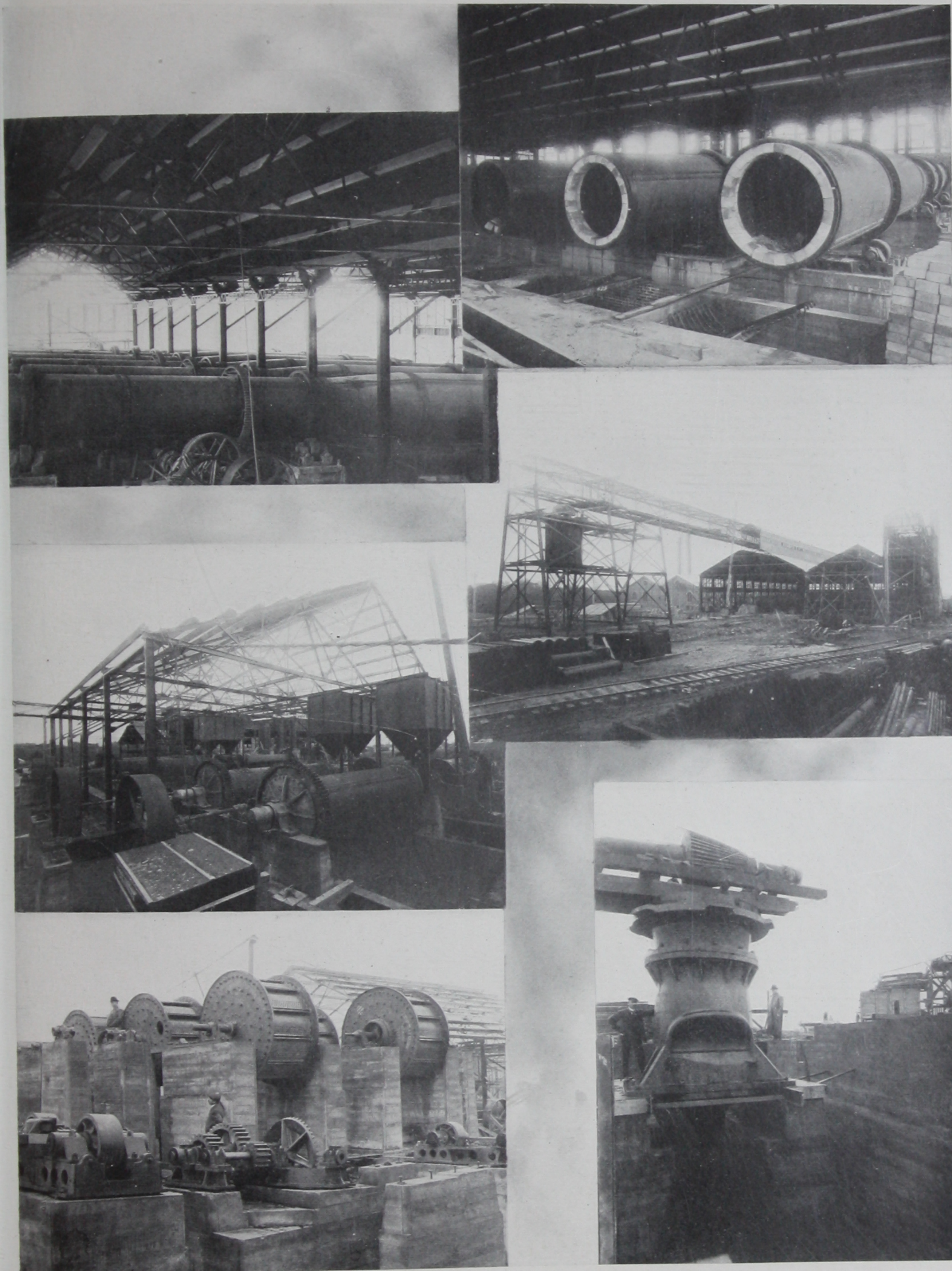


Cut Showing the Plant of The International Portland Cement Co.
(COWHAM SYSTEM)
Modern in Every Detail.



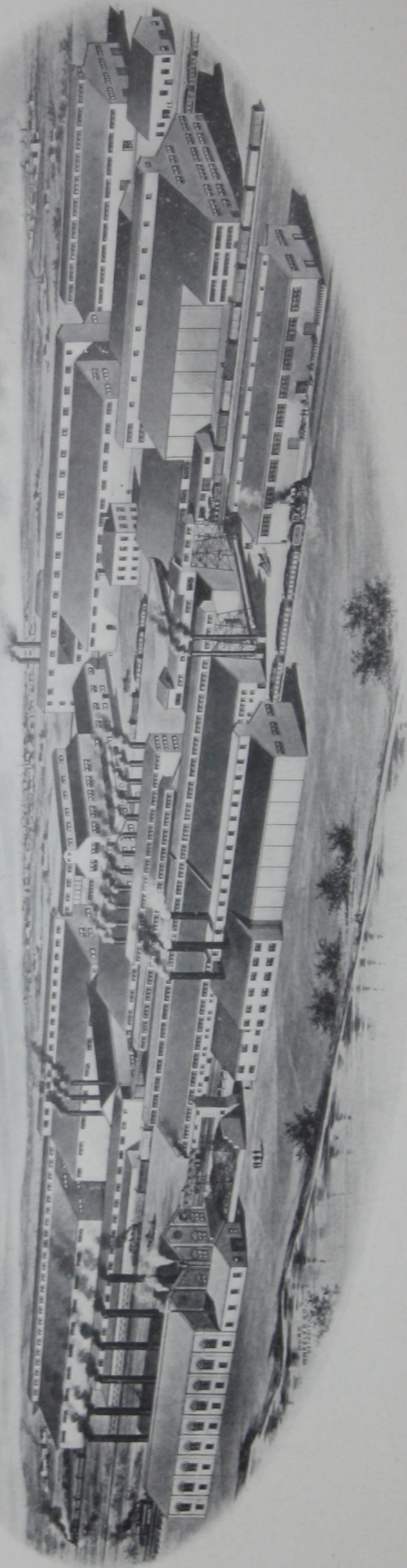
Bird's-Eye View of the Mammoth Plant of the Western States Portland Cement Co.
(COWHAM SYSTEM)

Every improvement that American genius can devise is incorporated in these Works. The machinery, designed and installed by master hands, electrically driven, carries the raw materials through the entire process of manufacture without the agency of human hands.



Some of the mammoth machinery during process of installation in the great works of the
Western States Portland Cement Company.

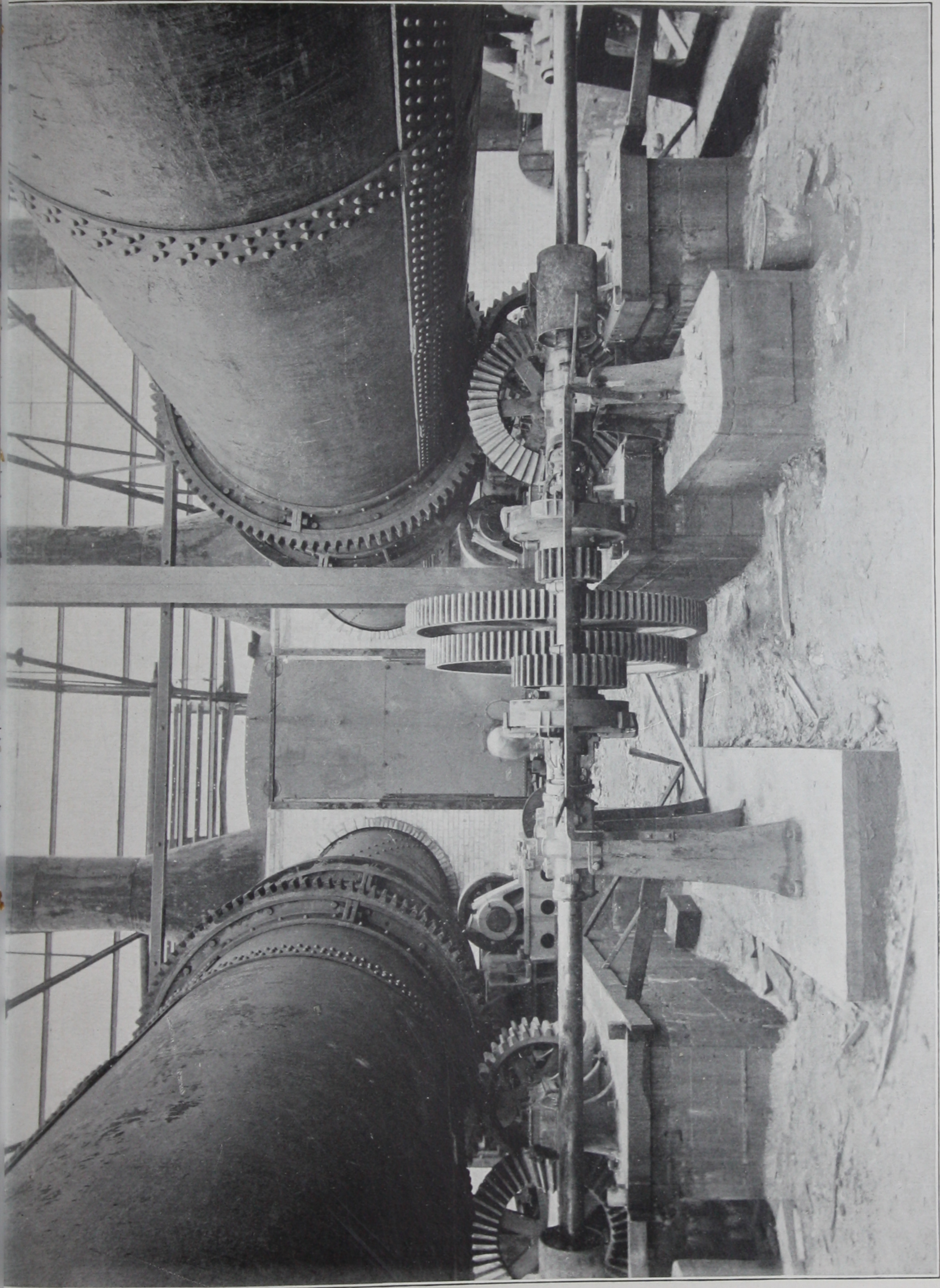
These works are of special design throughout and this plant is recognized as the leading and best equipped cement mill in the world. Although this plant has been in operation but a short time its product is already recognized as the superior and leading brand and is given preference over other cements in its market—commanding the very highest prices, while its cost of production, because of superior equipment, is considerably less than that of any other cement mill in the world. Not only is the machinery in this mill of superior quality and design, but the plant throughout is also built with the view of permanency—thus eliminating a great amount of maintenance expense incident to the usual cheaply constructed cement plant. The equipment of the SOUTHWESTERN STATES PORTLAND CEMENT COMPANY will be designed by the same master hands and no effort will be spared to install the most complete and perfect cement mill ever constructed and one which will produce the highest grade of Portland Cement for the least possible cost.



View of the immense works of the Northwestern States Portland Cement Co.

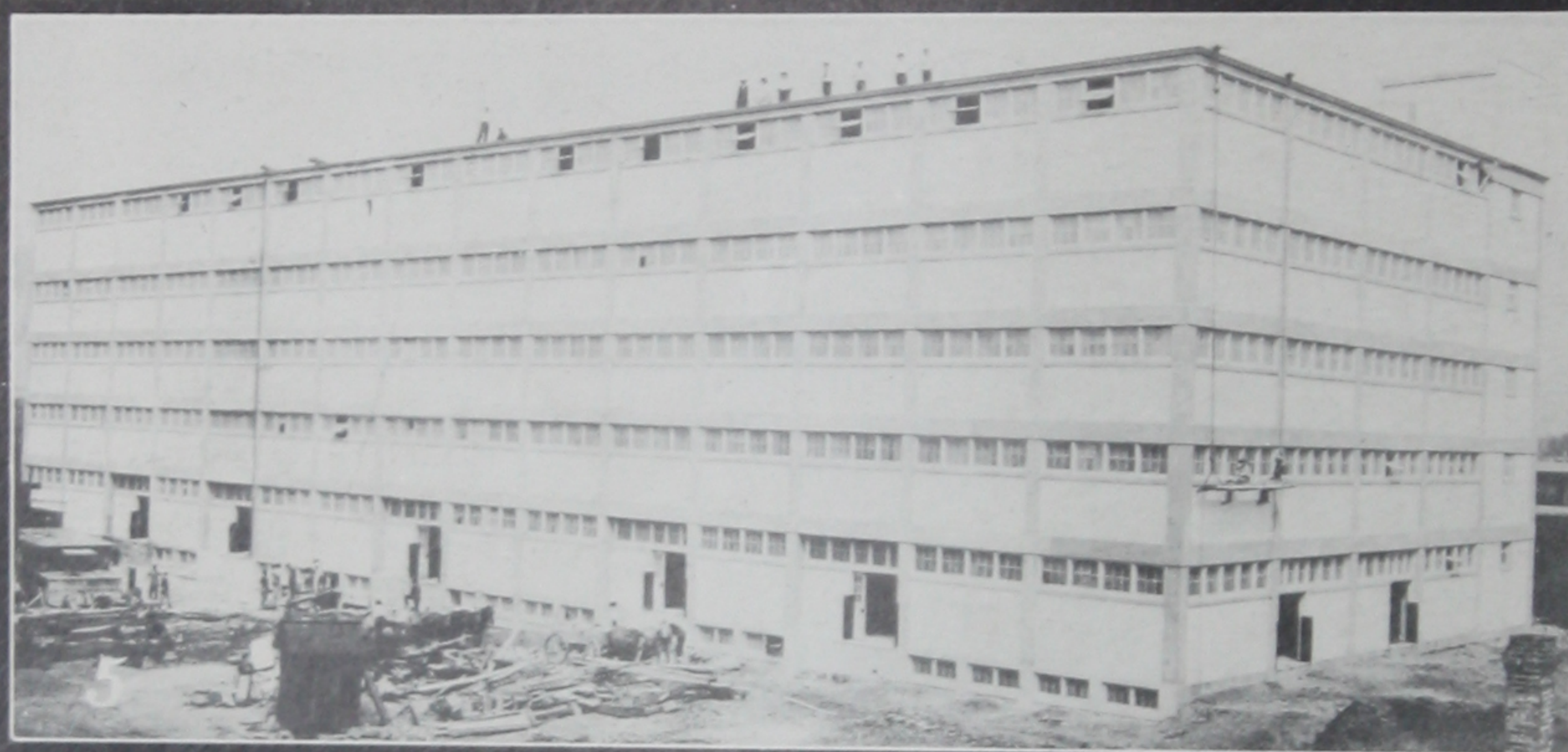
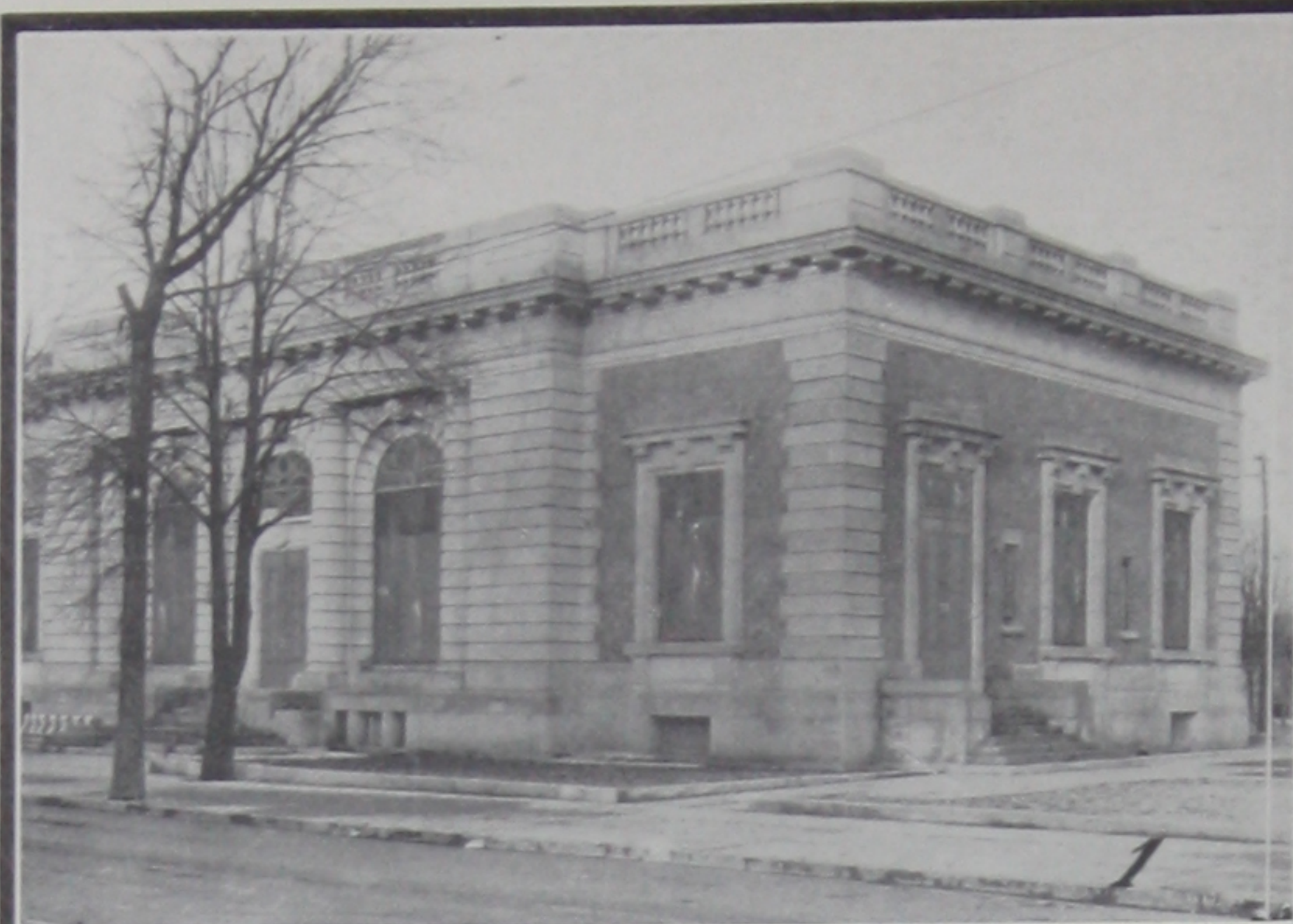
(COWHAM SYSTEM)

In this plant is concentrated the study of years in cement mill construction and is the crowning effort of long experience and intimate technical knowledge.

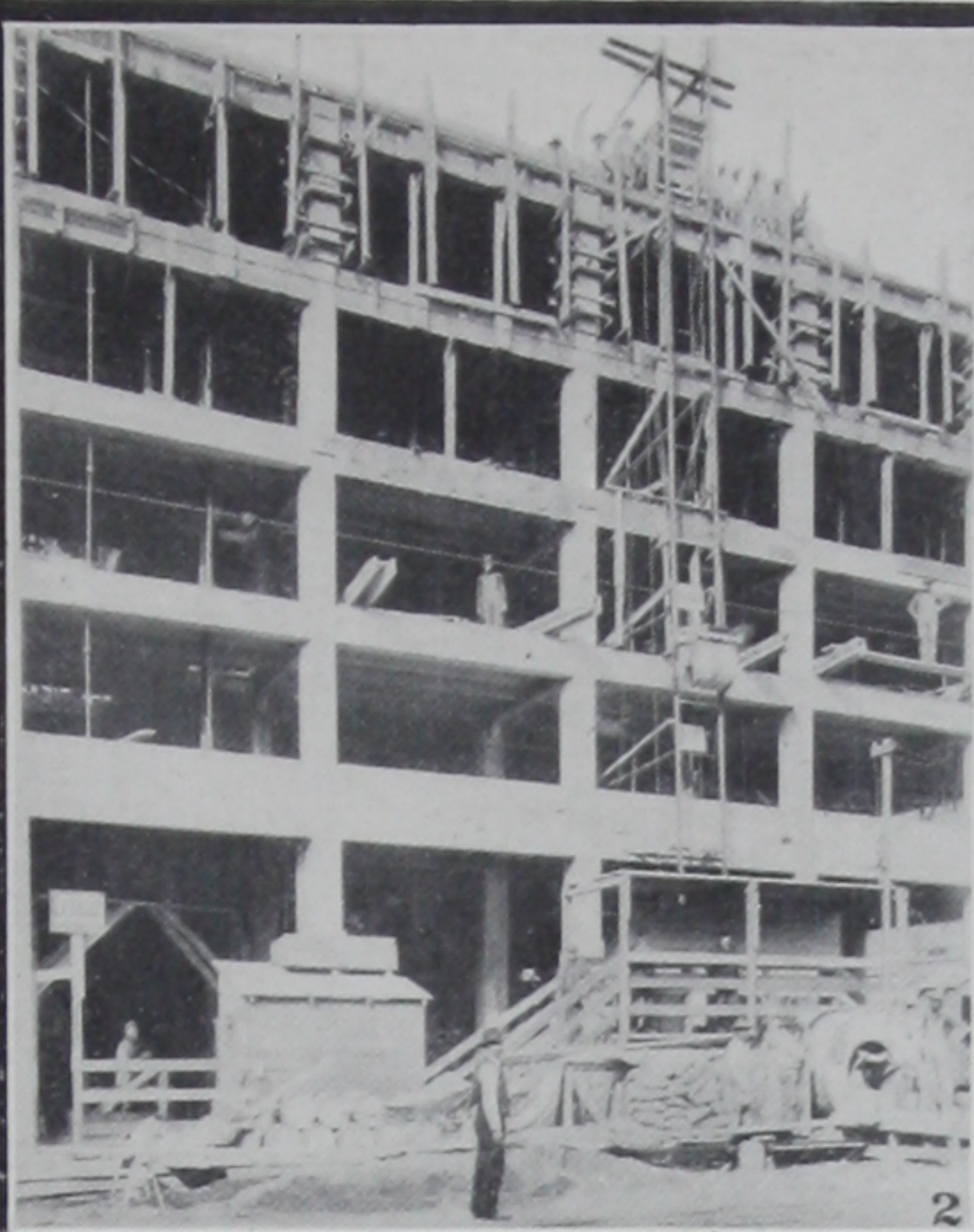
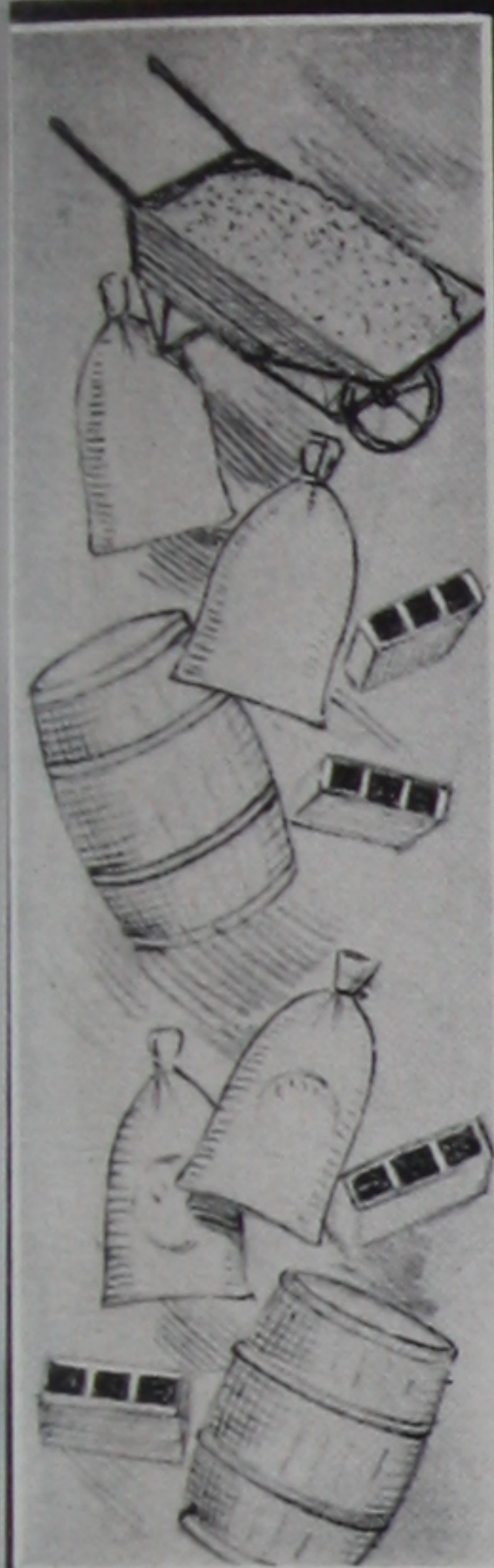


Two of the Mammoth Rotaries on their Mountings.
(COWHAM SYSTEM)

Rotaries, gearing, etc., all specially designed and constructed. These rotaries are electrically driven, independent of each other, and are conceded to be the most efficient equipment ever installed in a Portland Cement factory.



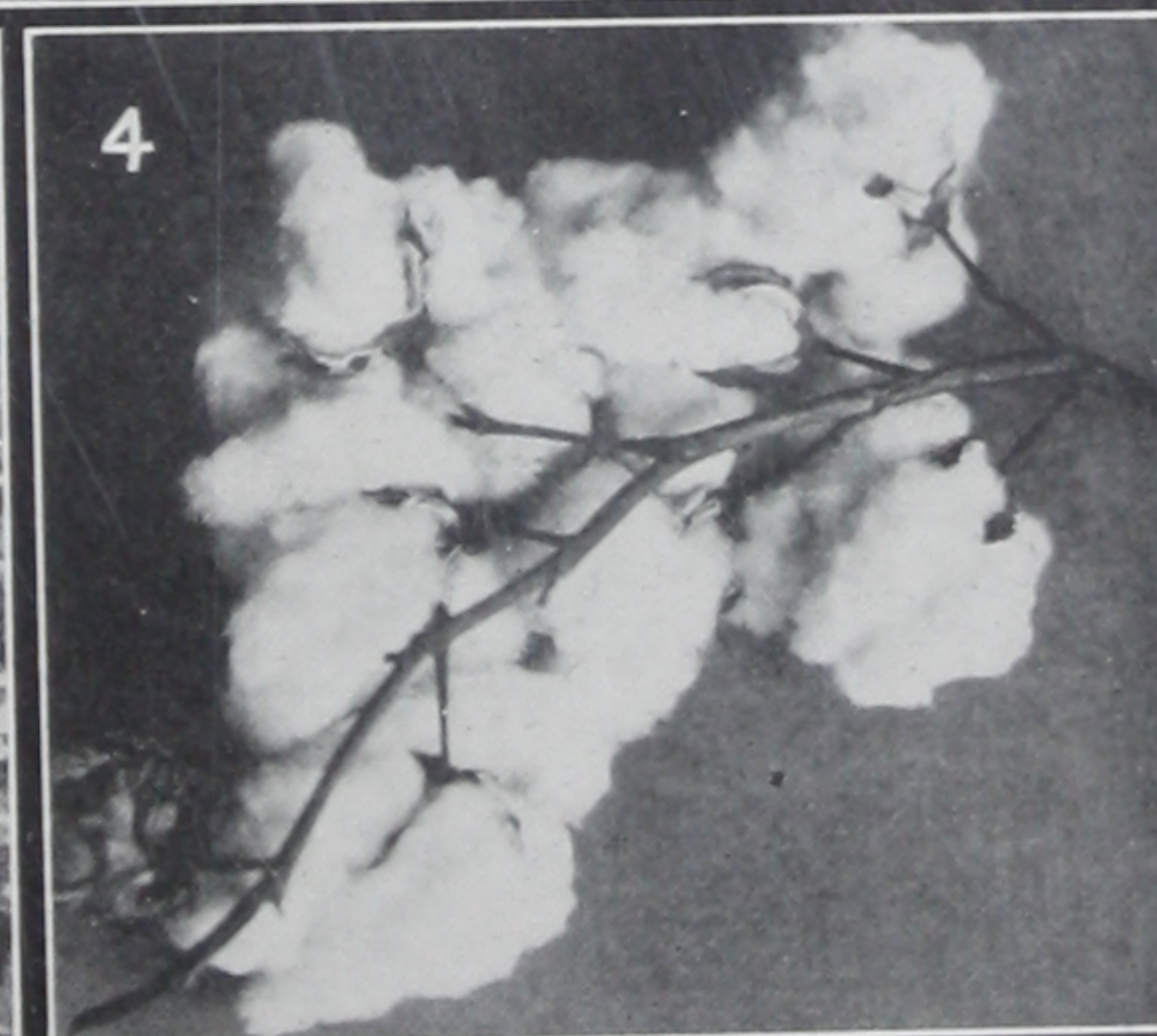
1. Post Office, Battle Creek, Mich. 2. A. Booth & Co. Warehouse, Detroit, Mich., 12,000 bbls. cement used. 3. Anderson Carriage Co. Warehouse, Detroit, Mich. 4. Cement Pipe, 10,000 feet of which was laid in Jackson, Mich. in 1906. 5. Warehouse 100 by 250 ft. of the Oliver Chilled Plow Works, South Bend, Ind., 10,725 bbls. cement used. 6. Concrete Chimber Dam near Lyons, Mich., having 26 ft. water head generating 5,000 H. P. Length of Concrete 475 ft., width of gateway, 200 ft.; 22,200 bbls. of Cement used in construction. 8. Rogers Dam, Big Rapids, Mich., 17,490 bbls. of cement used. Wm. G. Fargo, "Peninsular" Portland Cement (Cowham System) used exclusively in all of the above construction. The Reinforced Concrete Pipe Co. of Jackson, Mich., manufacturers of the Pipe shown in fourth picture, have supplied the pipe on many large improvement works, among them during the last year being immense sewer contracts at Wyandotte, Mich. and St. Joseph, Mo. The Engineer's plans and specifications for the Owens River Aqueduct which is to furnish the sole water supply for the city of Los Angeles, Cal., call for a conduit of this kind of construction 250 miles long and necessitating the use of 1,280,000 barrels of Portland Cement, (10,000 car loads—500 train loads) the total cost of the entire project being estimated at \$23,000,000.



1. Security Building, Los Angeles. 2. Hayward Building, Los Angeles. 3. Hellman Building, Los Angeles. 4. Development Company's Building, Los Angeles. 5. Hotel Hayward, Los Angeles. 6. Pease Building, Los Angeles. 7. Concrete Bridge. 8. Southern Pacific Depot, Santa Barbara, Cal.
"Western States" Cement (Cowham System) used exclusively in all of the above construction.



1. Alfalfa Meadow. 2. Threshing Scene. 3. Wheat Harvest. 4. Corn and Melons in young orchard. 5. Making Cane Syrup.
The products of the soil are the foundation of all wealth and nowhere has nature been more generous in her provision for its accumulation than in this great State of Texas.



1. Cotton cultivation. 2. Cotton picking. 3. Baled cotton at the market. 4. "Excelsior Prolific" Cotton. 5. Loading for shipment. 6. "Marlboro Six Locks" Cotton. Texas, the home of "King Cotton." It has been estimated that twice the annual product of the gold mines in the world would be required to pay the Southern planters for one year's yield of lint and seed.



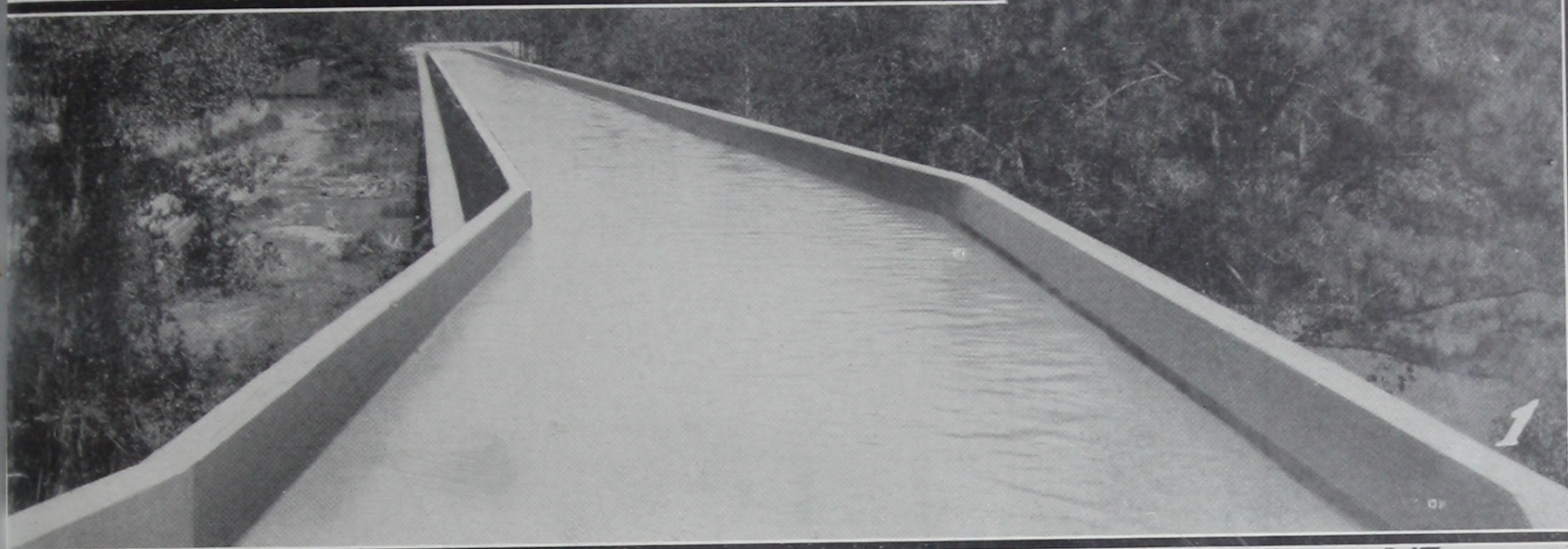
1. Apple orchard. 2. Orange grove. 3. Banana grove. 4. Gathering peaches. 5. Pear orchard. 6. Plums. 7. Fig trees.
Fruits of all kinds and varieties and of the finest quality grow in abundance in fertile Texas.



1. Cuban Tobacco. 2. Tobacco ready to cut. 3. A field of garlic. 4. Cabbage field.
5. Young tobacco. 6. Onion seed farm.
Texas, the only rival of Cuba and Sumatra in growing that leaf of fine quality and delicious
flavor which is the standard of the world for high grade tobacco.



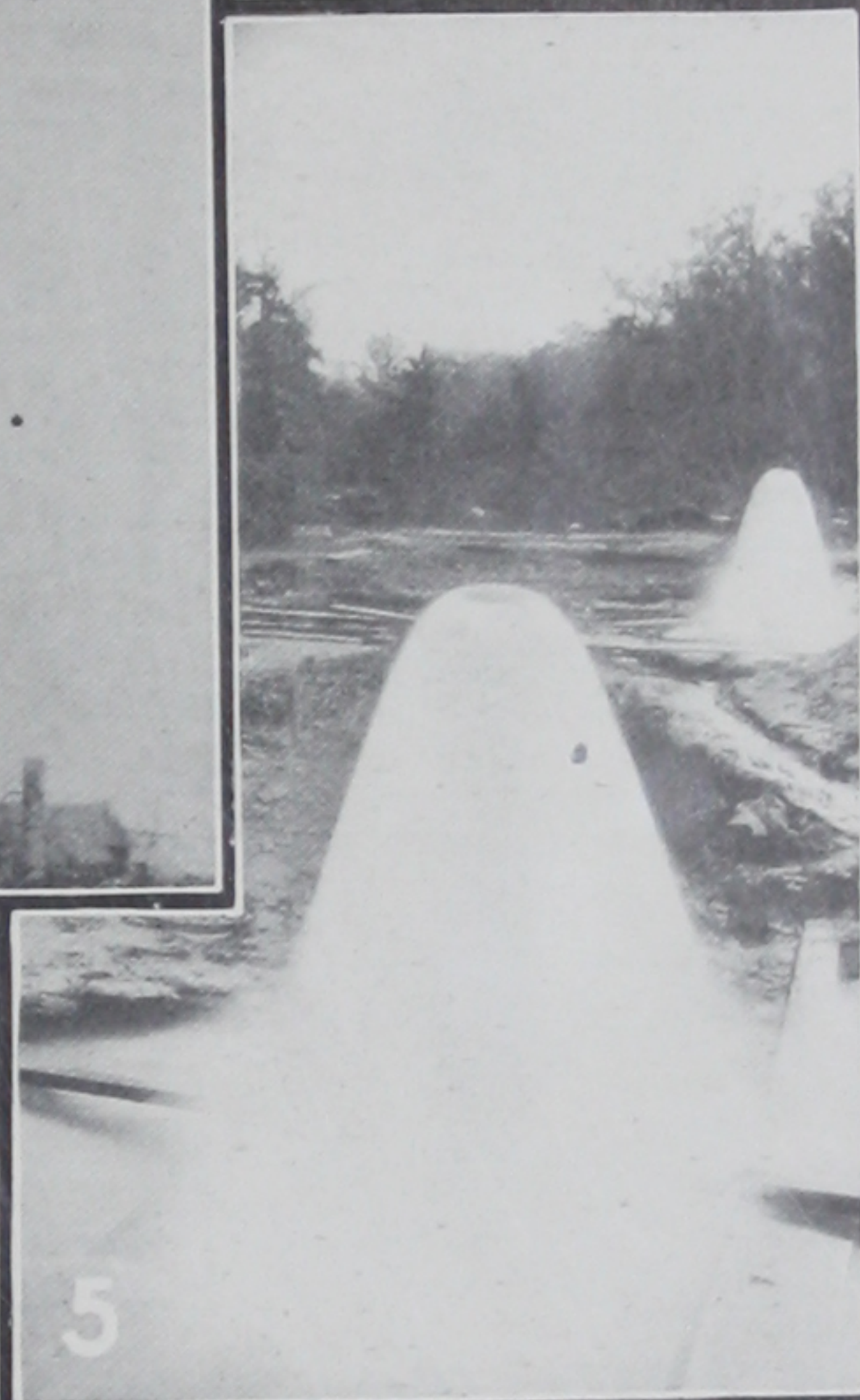
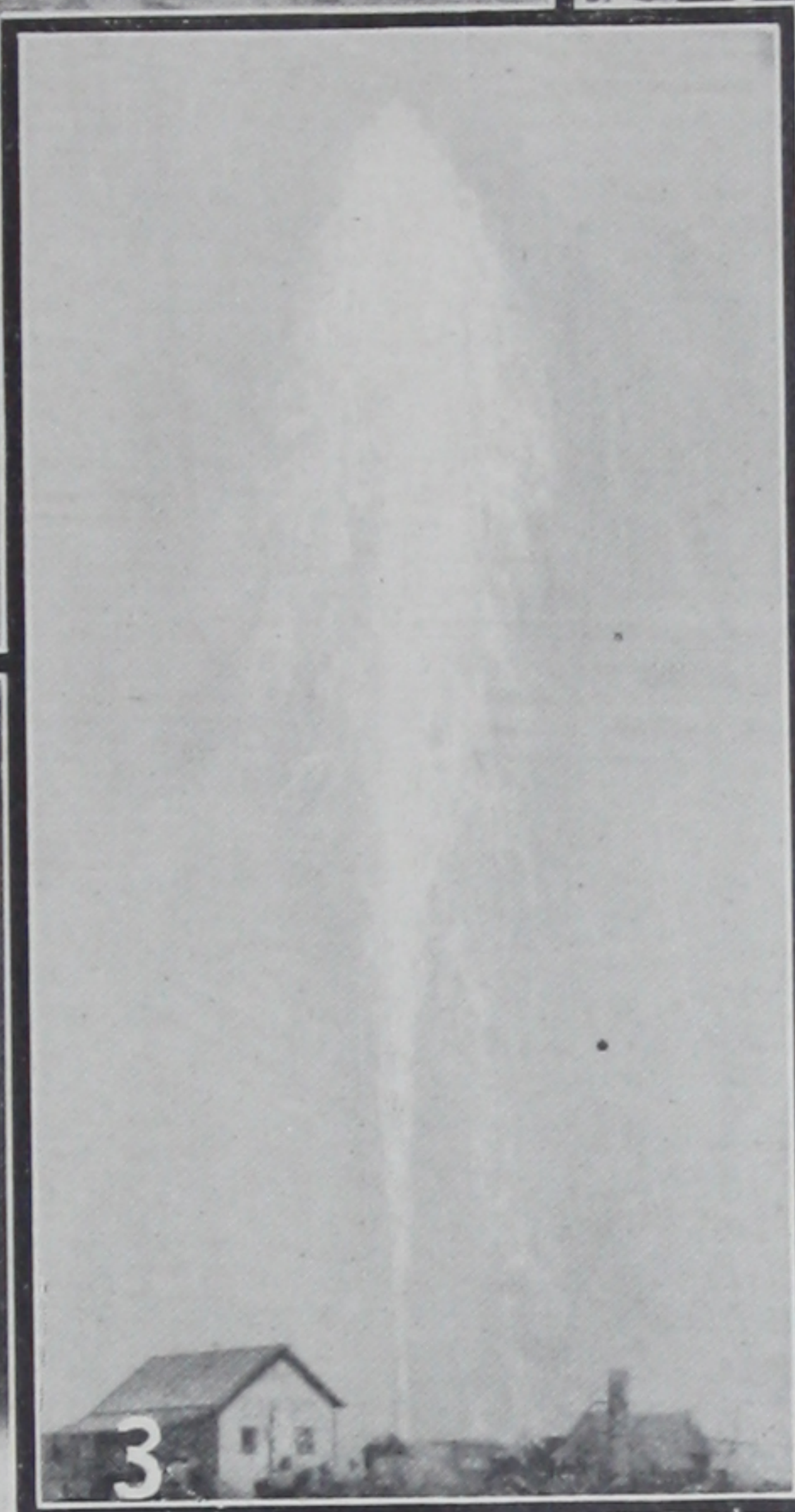
1. Tobacco, peanuts and cotton. 2. Sweet Peas grown for seed. 3. Strawberry Patch.
The prolific soil of Texas is amply evidenced by the great crops of semi-tropical fruits and vegetables grown in endless variety and profusion.



1. Portland Cement irrigation issue for Rice Fields. 2. Harvesting Rice. 3. San Jacinto Rice Company's Canal. 4. Transplanting Rice. 5. Where the plants are grown.
The diversity of Agriculture knows no bounds in Texas. Concrete irrigating canals whose aggregate length is hundreds of miles and many artesian wells furnish water for the irrigation of over 500,000 acres of rice lands now under cultivation in Texas.



1. Branding Cattle. 2. Rough Riders. 3. Prize winning pen of Southdowns. 4. Pen of Blue Ribbon Berkshires. 5. Premium Bull. 6. Group of pure blooded cattle. 7. A worthy Domesticated breeds of pure blooded stock have replaced the herds of "Longhorns" and Texas is fast becoming the leader in the dairy industry as it has long been in the raising of high-grade stock for market.



A few among the hundreds of flowing artesian wells that abound in Texas. Such wells are common in the vicinity of this Company's Plant and may be secured for the drilling.

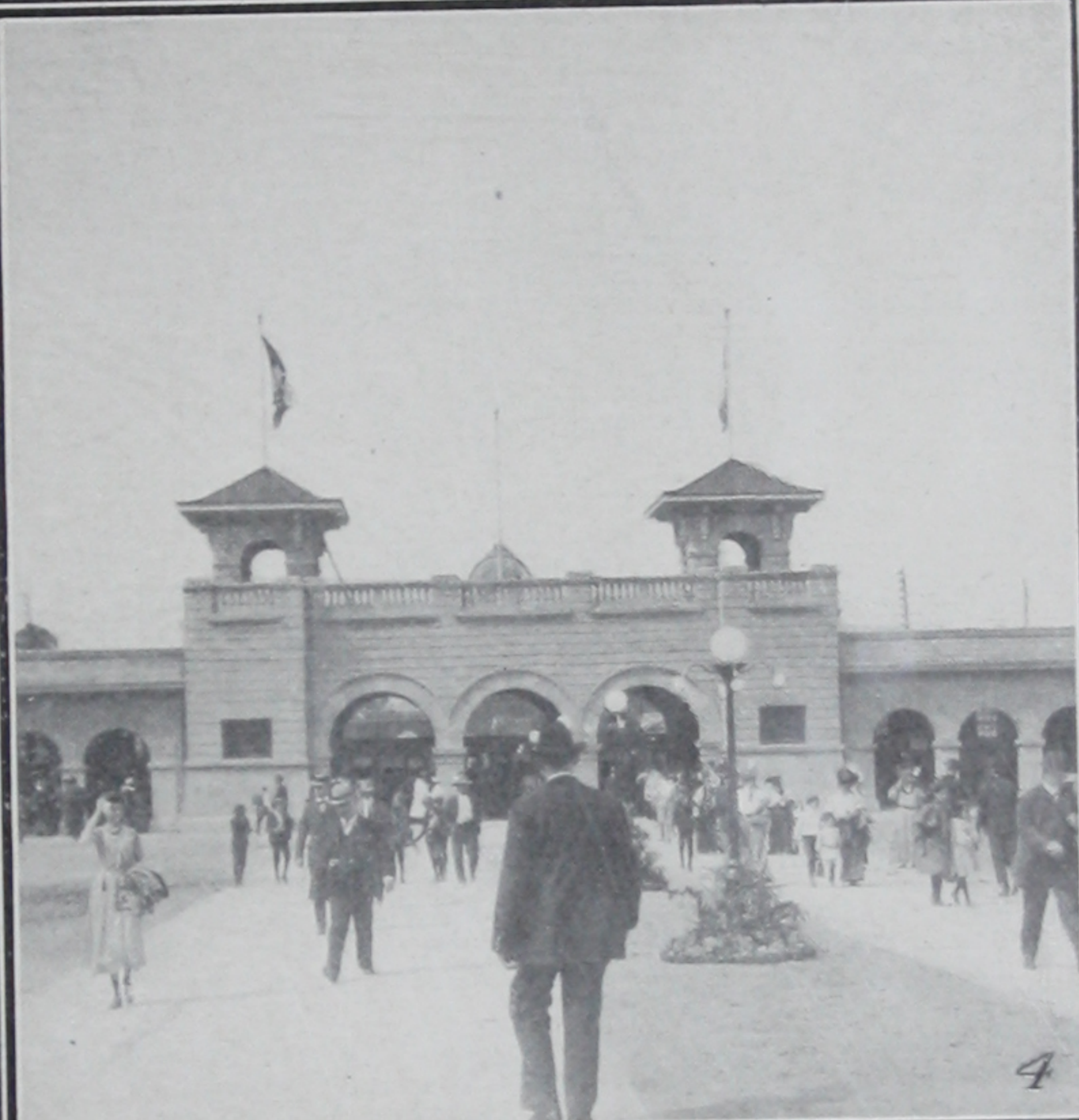
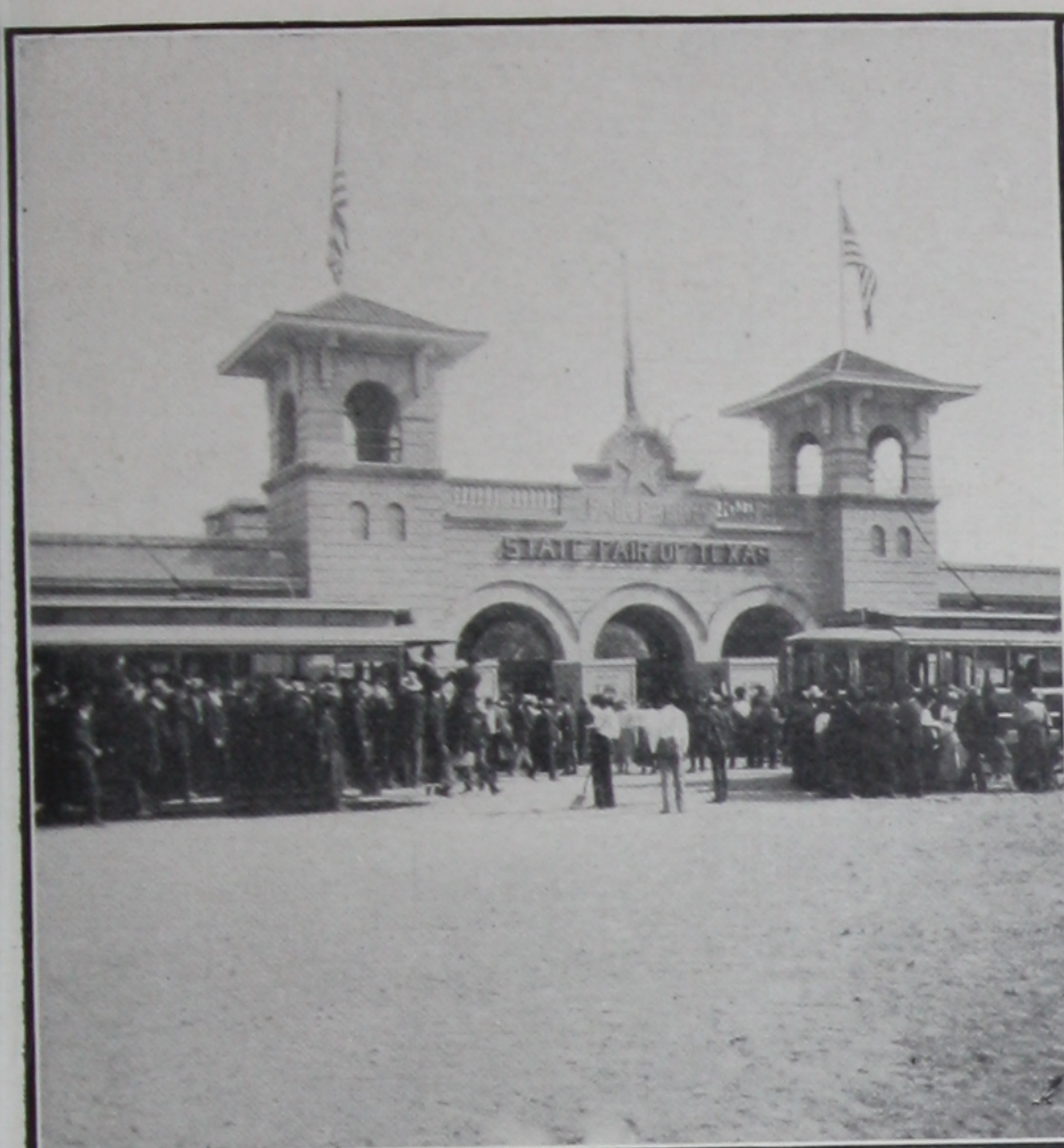
In number three is shown a well from which the water comes to the surface through a six inch pipe and when reduced to a two inch opening is thrown to a height of 102 feet. From the other illustrations may be gained some idea of the immense volume of water flowing from these wells and the great extent of territory each one will irrigate. In no part of the country is the farmer so little affected by the fickleness of the seasons.



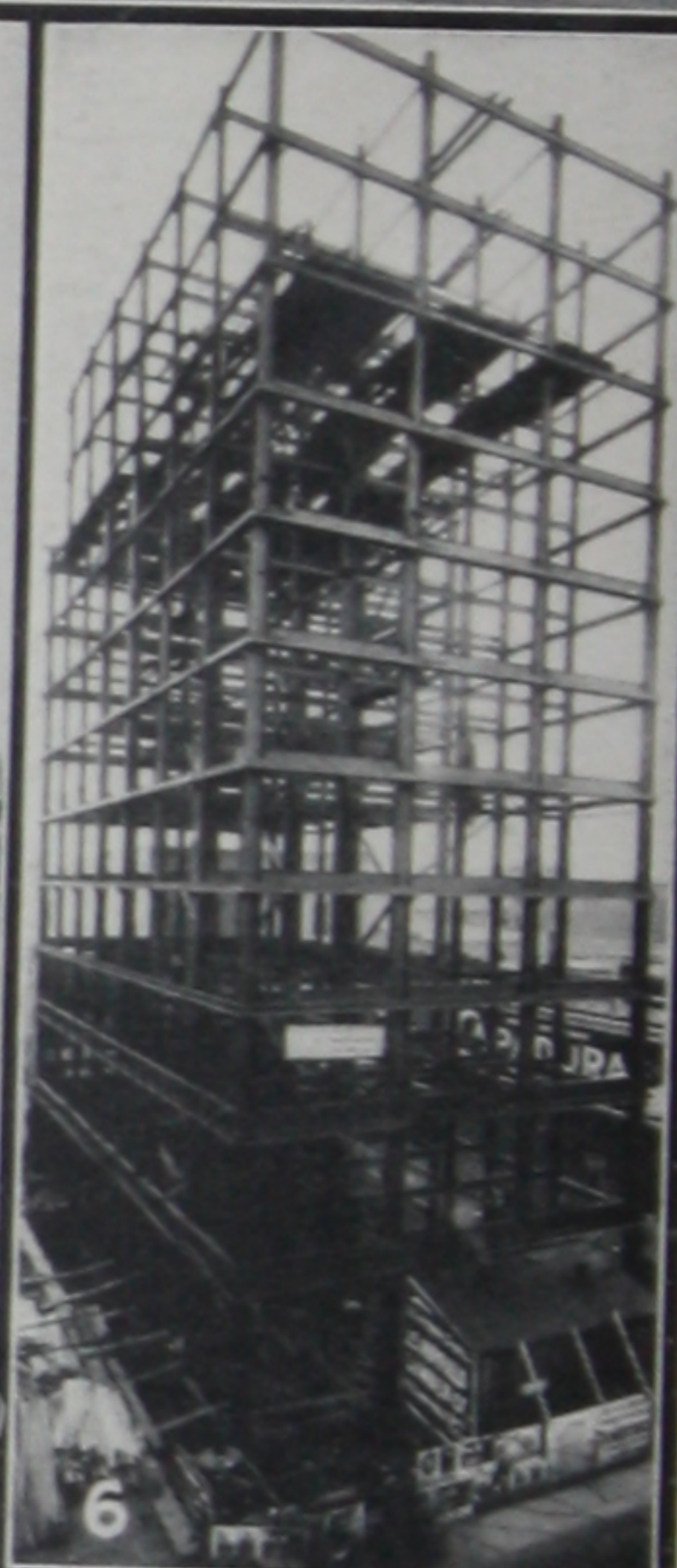
Thirty-five varieties of products, all gathered on the same day, Sept. 30, 1906, from one Texas farm.

While this section dominates in cotton growing, tobacco raising, sugar and rice culture, and has demonstrated its ability to raise practically every crop that may be grown in this country, it has as yet scarcely given a hint of its real capabilities in agriculture even as far as general food products are concerned.

No other State is to be compared with Texas in the production of fruit of extra fine quality and flavor. Here grow single clusters of grapes weighing from two to four pounds each and not a faulty member among them; peaches measuring eleven to thirteen inches in circumference, perfect in fineness of texture and of delightful flavor; apples, pears, plums and all other fruits, each in their many varieties, do equally well; wagonloads of watermelons ranging in weight up to 75 pounds each come to the local markets, and their arrival by train loads is eagerly awaited in the less favored climes of the North and East. Here are brought to market vegetables of every description, almost in the conceivable in size and all of perfect form and surpassing quality; there were exhibited last season two pumpkins, the largest and smallest of seven grown on a single vine, weighing respectively 104 and 94 pounds. Here are harvested great crops of wheat, oats, corn and other grains that are the wonder of all beholders. Where does such another condition obtain? Where, but in Texas?



1. Portland Cement Archway Entrance to State Fair Ground at Dallas. 2. Entrance to Park on State Fair Grounds. 3. Hanley Amusement Park on Dallas and Ft. Worth Int. R. R. 4. Inside of Fair Grounds entrance. 5. Portland Cement buildings on Fair Grounds. 6. City Park and Majestic Hotel.
These great exposition grounds of the Southwest whereon are exhibited the products gathered from the farms, ranches and factories of Texas have many times been visited by over 100,000 people in a single day.



1. Imperial Hotel. 2. City Hall. 3. Trust Company Building. 4. Linz Building.
5. Court House. 6. 14-story Praetorian Building. 7. Wilson Building. 8. City National
Bank. 9. Oriental Hotel.
"Great is Dallas for the valleys and hills for leagues in the golden southwest will bring
her tribute."



of Ft. Worth, Texas.

During the past two years there have been erected on four of the principal streets of Ft. Worth over four thousand front feet of stone and brick business blocks, every one of which found a ready occupant as soon as completed. In the residence district building has progressed in like proportion. The Court House is one of the finest county buildings in the United States and the Texas and Pacific Railroad Passenger Station is the finest building of its kind in any city of 70,000 in the world.



The many other fine buildings, both public and private, including the splendid Public Schools and Churches, and the large number of magnificent residences, denote a degree of prosperity seldom equaled in a city of similar size and that insures a great future for Fort Worth.



1. Main St. looking West. 2. Paydras St. looking North. 3. Pacific St. scene. 4. Commerce St. view. 5. Elm St. view. 6. Main St. looking East.
 Dallas, already a metropolitan city of large affairs, and giving promise of greater things in the future to the glory of herself and the wonderful State of Texas.

APPENDIX.



ISTORY chronicles vaguely the events of a period known as the "STONE AGE," when men wrought with the crudest of implements and eked out the merest sort of existence. But man's necessity made him progressive and his cunning taught him to devise better instruments of "BRONZE" with which to serve his purpose, only to find them in turn inferior to the improved work of his son in the "IRON AGE."

Each plays its part in the economy of NATURE, then yields place to its betters, and the STONE AGE, the BRONZE AGE, the IRON AGE retire, yielding the palm to the IMPERIAL AGE of Cement.

No product in the world has a wider application to useful purposes than Portland Cement. Men who know its worth realize that it is the only absolute fire-proof building material in the world. In this respect brick, terra cotta, iron, and granite all suffer markedly by comparison with it.

It is the ideal building material in bridge construction, whether for strength, form, beauty or durability. There has never been found a paving material on earth equal to Portland Cement concrete whether for side-walks, street-beds, or roadways. In house building there is hardly an article used that cannot be made stronger and more durable out of Portland Cement than out of any other known material.

Progress is the watch-word of the twentieth century. And it is with this thought in mind that we present the following pages showing the progress recently made in the cement business, and the present advanced ideas on cement constructive work. Our purpose here is to show something of what has been done, and to afford material for thought as to what can be done in future with Portland Cement.

PORTLAND CEMENT TO SUPERSEDE OUR LIMITED IRON ORE RESOURCES.

THE iron ore resources of the United States will be exhausted in fifty years according to statistics compiled for the Swedish Parliament, while the Misaba range iron ore deposits will be depleted in twenty-five years. What then? Where shall we turn for materials for construction? The timber resources of the country are already on the decline. Longer hauls and higher prices confront the consumer of to-day. We have used our iron and timber resources as if they were inexhaustible. Our great railways are taking time by the forelock by planting timber forests that will serve for replacing ties on their right of way. The government is promoting timber planting. In Europe, especially in Germany, this question has been carefully considered. For the past 75 years laws have been in force compelling every person cutting down a tree to plant two in its stead. The German forest areas are on the increase instead of decline. No such systematic effort can replace our iron resources, therefore we must look elsewhere for a substitute for iron and steel. This substitute is concrete. The depleting of our iron resources means the ushering in of the **Concrete Age**. In twenty-five years iron and steel will be used only where it is absolutely necessary; as for machinery construction and for rails—while modern structural steel sky-scrapers, railway and highway bridges, railway ties, etc., must and will be constructed of concrete with a minimum of steel scientifically arranged and imbedded therein, and known as reinforced concrete. This form of construction will in the near future be the rule and not the exception as at present. People talk of this being the **Concrete Age**. It is no such thing. It is simply a dream which future generations alone will realize. At present we are in the age of iron and steel. Its progress has been so vast and extensive that it will exhaust itself in half a century. It is now in its prime, this age of iron and steel. Men now living will witness its decline. Its life has been measured in cold figures which cannot be denied. Steel and iron must and is making way for the age of concrete. The foundations for the **Cement Age** are being laid today upon which a superstructure will rise that will indeed represent the **Age of Concrete**. To-day is simply a fringe on the borderland of our industrial energies, gradually pushing inward, never losing the ground it has gained. Its destiny is to girdle the earth with its conquests. This is its mission which must and will be fulfilled before it can be crowned as the **Age of Concrete**.

THE ERA OF CEMENT CONSTRUCTION.

By JULIUS KAHN, ARCHITECT AND ENGINEER.

It is not generally recognized that we are at the present time in perhaps the greatest constructive epoch in the world's history. This age shall probably be classed as the steel age in 100 years from now. People in general are too busy to realize the importance and size of the works which are at the present time under construction. In fact, we are all too busy with our own personal matters to realize the greatness and significance of this movement in construction.

Whereas, 40 years ago the manufacture of iron and steel was as yet too expensive and too poorly developed, at the present time machinery and chemistry have advanced to such a high stage of development as to allow the manufacture of this material to reach a high state of excellence.

The fact that this has been done so well has encouraged engineers, builders, and architects, and at the present time a majority of the buildings erected are mainly of a steel skeleton framework, which supports the floors and walls, the latter being merely a light protective covering for the steel work. This high state of development in the steel industry has allowed the building of enormous structures in New York, Chicago, and all the large cities, as well as here at home.

If brick and masonry had been employed, the foundations and lower story walls would probably have been so heavy and expensive that financially this size of structure could not have been made profitable. But with the use of steel the supports and foundations were made comparatively small and little floor space was occupied by them. Apparently to an outsider it seemed a mystery how the upper floors were supported on the lower, the real supporting members being entirely hidden within the masonry.

At the present time there is a revolution going on in construction in general. There are many things to indicate that we are at the present time passing out of the iron and steel age. It is only about 25 years ago that the steel age could be said to have had its modern beginning. The Bessemer and Open Hearth process of steel manufacture wrought a revolution in construction in general, and at the present time its use has reached the highest point in its history. Will it decline? This is a grave question, and from present indications it would seem that the answer must be affirmative.

There are certain things in connection with the use of steel that will not allow it to satisfy the value of the engineer and architect. If steel could be so thoroughly protected as to be absolutely fire and rust proof there would not be so many objections to it. But in these two respects it is seriously lacking. The best chemists of the country have been studying to find a rust proof covering for steel. Leading engineering societies have had the subject up for discussion continually for the last five years, but so far no satisfactory solution has been reached. One man will say he has discovered the proper paint covering, but when tested it will fail after a time like everything else that has been tried. A few years ago there was a great rush over oxide iron paint. Everybody said it was the proper material to use, and its application was really quite universal. Then it was found that rust spots multiplied underneath the covering. This was attributed to a galvanic action claimed to exist between the paint pigment and the metal. Then came the red lead theory, and many engineers were strong in advocating it, but it ended in the same way. Then the graphite theory, and Detroit may be said to be one of the first places that practiced it; in fact, Detroit claims to have built the first graphite paint factory. This paint, however, has been criticized almost as severely as the oxide of iron, as rust gathers under it in just the same way in a large number of instances, and painting must be done with great regularity. Recently chemists had ad-

vised the use of gum oil paints; that is, paints composed of the natural gums, with pigments and oils as necessary. This gives a brief idea of the theorizing which protective coating for steel has undergone. At a discussion of a recent meeting of the American Society of Civil Engineers, a number of the most prominent members claimed to have discovered such a covering and held the same secret, not for reasons of desiring an exclusive patent right, but on account of uncertainty. As yet the paint theories are anything but reliable.

An ordinary exposed steel structure has a life all the way from 10 to 30 years, depending upon the care given it in its protection. As an example, near at hand in many of our M. C. R. R. viaduct bridges it was recently found that the steel beams were eaten through on account of the corrosive action of the gases from the locomotives, and required replacing. In fact, some railway companies are replacing steel with concrete bridges, because steel is not reliable, nor permanent; among these may be named the Michigan Central, Illinois Central, Pere Marquette and others.

The question is anything but solved. There is scarcely a month but that some man comes forward with a preparation which he hopes will do it, but so far they have all failed.

Again, steel is lacking in fireproof qualities. Under a heavy fire steel will melt like wax. Although a high temperature is required to make a liquid of it, a comparatively low temperature converts it into welding state. Under anything like extreme heat and heavily loaded it will curl up and collapse. Unless well protected against fire, it is little better than wood construction under certain conditions. As a result of high temperatures the latter, when made of heavy timbers, will char and burn only on the outside, without deep penetration, and for this reason mill construction, which consists entirely of such timbers, is used very largely. It originated in the cotton mills of New England and is now used largely in all factory construction. In this type the floors are made of planks four to six inches wide, set edgewise and nailed together. The posts are of very heavy proportions, so as to prevent quick burnings. Buildings of this type will stand very severe fires, and there are engineers who believe mill construction to be better than steel, unless the latter be well protected. It does seem that if a new type of construction comes into use that will provide a permanent and fireproof structure, the steel age will draw to a close. At any rate, it is a subject that engineers are studying more earnestly than ever before, and they are coming to the conclusion that cement construction affords relief from these vexatious problems. Cement is now manufactured of such excellence, at such a low price, and so thoroughly answers the wants of the engineer that there is no question that it will replace steel construction. The only question is how fast it will do so. There is probably no subject so much discussed by engineers now as concrete and concrete steel construction.

It must be granted that concrete has this against it, that if poorly made, it is deceptive; but on the other hand, if the carpenter uses timber that has dry rot, is worm-eaten, or has serious knots or wind shakes, which deficiencies cannot be perceived by the ordinary layman, and even by a thorough engineer, the dangers are much greater. Thus the carpenter may deceive. Again, steel work may be even more dangerous and deceptive if the connections and sizes are not right, or if anything about its make-up is slighted. These risks must be carefully guarded against. The engineer figures heavy loads for every square inch of steel, and the dangers are proportionately greater if workmanship or quality of material is below the standard; he is careful that a test be made from every batch of material. Then, again, he guards against the workman's poor riveting, the winding of steel members, the security of connections, etc. There are a hundred ways in which errors can creep in, any one of which may wreck his structure. It must be assumed that skill is not required to such an extent in concrete work. If a good brand of cement is used, it only remains for the superintendent to watch the proportions of mixing, its manipulation and placing in structures, and he is assured that the strength is ultimately there. There is this consolation, too, instead of becoming weak with age, as steel, owing to its corrosion, or as wood, owing to its rotting, the strength of cement construction continually increases and moisture only serves to make it harder.

Again, it is as fireproof as any material known. If this is so, the question may be asked, why is cement not used more largely at the present time? In answer I will say: "It is only very recently that America was able to produce the excellent quality of cement it now produces, at a marketable price. Europe led us, but Europe is now conservative, and our rapid strides have placed the American product in the front rank."

It is no longer as it was ten years ago, that European Portland cements are specified in our best construction works. Now American Portland cement is used. In fact, it is probably only seven or eight years since we made Portland cement in any considerable quantities. Our own cements were formerly the natural cement, but in the past few years America has put up Portland cement factories not only equal, but far superior to those in Europe.

But, again, used under other conditions, cement is as effective as steel, without its defective qualities. Concrete is excellent when used in compression, but it is not so good as timber in tension, as it has about one-fifth of its tensile strength. For that reason engineers did not formerly use concrete where such strains were carried. But now comes a new method, called concrete steel, or "reinforced concrete" construction, which enables us to use cement in tension as well as in compression. This type of construction will work a revolution in the use of steel, for, if concrete, with steel imbedded in it, be as good in tension as in compression, then it is an ideal material, for it gives the necessary strength, is fireproof and permanent.

Probably no subject is now so much before engineers and engineering societies as concrete steel construction. Different engineers have different ideas in regard to placing the steel within the concrete. There are at the present time 50 to 100 different systems or ways of doing so. These differ from one another in the arrangement of the steel within the concrete, but all agree that the steel must be placed in the concrete where it takes the tension. Of course the concrete is used for compression. Again, there is no material which so thoroughly protects steel as concrete, and steel imbedded in concrete is as permanent as masonry itself. The simplest form of this construction is a rectangular beam, with steel rods imbedded in the lower side. With such a beam a load placed on same tries to deflect it, and the steel at the lower side comes into tension, the concrete above it into compression. The greatest virtue of concrete in this construction is the union which the steel makes with the concrete. This adhesive property of concrete was only realized in the last few years and gave birth to the present concrete-steel system of construction. As before stated, there are from 50 to 100 systems. Some of the best ones come from Europe, in just the same manner as the best Portland cements originally came from Europe. A few of the European are the Von Emperger, the Mennier, the Considere, the Hennebique, etc., and in this country we have the Ransome, the Expanded metal, the Columbian and the Johnson, etc. These systems are well represented by many structures at the present time. They all have in common the placing of steel on the tension side of the concrete, and differ only in the form of the steel or its arrangement.

One thing more in favor of concrete is its use for long floor spans in building construction. Spans as large as 25 feet are easily constructed at the present time, and there are many records of concrete spans 50 to 100 feet long. Only very recently I was called to witness tests where the walls, floors and columns of a building consisted of concrete, with floor spans of 24 feet 6 inches. I was unable to attend, but I understand a number of very prominent engineers were present. The records of the tests were sent to me. These spans carried without serious deflection a load of 100,000 pounds uniformly distributed over them. Two concreted steel beams supported a concrete slab four inches thick on which the weight was piled. The actual sagging under this enormous load was only $13\frac{32}{100}$ of an inch. If a steel beam of the same strength had been used, it would have settled $13\frac{1}{4}$ inches, thus showing that the properties so greatly desired by engineers have been more than realized in concrete-steel, as the latter can be constructed so as to deflect under weights only one-quarter as much as steel.

There is another remarkable advantage for concrete-steel construction. In buildings constructed of brick or stone, the vibrations due to the moving parts of machinery

are very great, but in the case of concrete-steel it is little or nothing. In this regard it is of great advantage in factory construction. The experimental stage in concrete-steel construction has passed by. It is an accepted fact among all engineers that concrete-steel construction has come to stay.

The only matter of discussion among them is how shall the steel be placed within concrete, and some little variation as to the proper proportions and proper mixture of concrete. These, however, are matters of detail. It is quite generally understood how good concrete can be made, even though some may understand better than others its mixing and manipulation. It is useless to try to go into a description of all the forms of concrete construction that can be made. Suffice it to say that buildings are being made entirely of concrete (including the columns, walls, floor spans and roof), making a building absolutely fireproof. It is an interesting fact that a building constructed of concrete steel is not necessarily heavier than a steel building, and costs less than one-half as much. Construction of this nature is permanent, rust-proof, fireproof and rot-proof. This is a remarkable relief to the engineer who for years has studied the art of preserving to the community its costly structures.

In Europe there is a large amount of this work. I have in mind one concern that did \$25,000,000 worth of concrete-steel construction this last year. This construction is coming into the American market at the present time, and it was from a structure by this concern that the tests mentioned before were made.—*Detroit Tribune, February 9, 1903.*



Cement Machinery Exhibit at Universal Exposition, St. Louis, Mo.

The possibilities of artistic designs in cement concrete work are here plainly apparent. This exhibit contains a large variety and styles of blocks, namely—Octagon, straight, corner, faced, rock, tool, ornamental, scroll, weather, broken ashlar, copings, mouldings, circular, column, veneer, retaining, globe, belt, glass faced, corner, $4\frac{1}{2}$ inch rock, 9 inch rock, three-quarter, half, quarter, fractional, watertable, shoulder, panel, 6 inch rock, 3 inch plain, balls, base and balusters.

FUTURE BUILDINGS TO BE OF CEMENT.

Walls and Superstructures of Concrete from Canadian Material.

CRIB WORK AND DAMS, TOO.

THE MEMBERS OF THE ENGINEERS' CLUB DISCUSS THE GROWING CEMENT INDUSTRY.

Last night the Engineers' Club of Toronto held an important meeting in their rooms, King street west. The gathering, which included some of the city's foremost minds in engineering and building, was presided over by Major Henry A Gray. The discussion was over the general use of concrete in building at the present time, and it seemed the concensus of opinion that stone masonry was a thing of the past, and that cement concrete will not only be used in foundations in future, but in the walls and all superstructures. The discussion was led by City Engineer Rust, who drew attention to the remarkable growth of the cement industry throughout the American States. Quoting the mineral resources report of the United States for 1900, he said that in 1894 the production of the 24 cement works in the States had been 798,000 barrels, while in 1900 50 works had produced eight and one-half million barrels. The imports for 1900 were over 2,300,000 barrels, while the total consumption of Portland Cement in 1900 was over 10,700,000.

GROWTH IN CANADA.

The City Engineer was unable to quote the figures of the Canadian growth of the cement trade, and light was thrown on this by Mr. M. J. Haney, who is a member of the club, and a well known civil engineer and contractor. The proportionate increase in Canada has been as remarkable as the increase across the border. In 1891, 100,000 barrels of cement were used in Canada, and of this 25,000 barrels only were made in this country. But in 1901, Mr. Haney explained, 1,000,000 barrels were consumed in the Dominion, and of this 500,000 barrels were produced at home.

This report of the splendid stride in one of Canada's most important branches was greeted with applause, which was repeated when Mr. Haney said that he believed the proper sentiment for Canadians to show was, all things being equal, to support home industry. He did not believe in importing anything into Canada that could be secured at home.

CEMENT IN CRIB WORK.

The learned gentleman from the City Hall turned his searchlight upon the question, "Should not concrete be used instead of cribwork in permanent harbor works?" and gave his opinion that he would, except in cases where stone could be procured in suitable proximity to the work, use concrete for bridge piers and abutments. Cement concrete, Mr. Rust says, makes better work and cheaper work. It was here that the City Engineer expressed the opinion that stone masonry will soon be a thing of the past, and that it will simply be a matter of time when Portland Cement concrete will be used in the construction of buildings not only for foundations, but for the outside walls and partitions. Later in the evening the Engineer gave the interesting information that concrete has reduced the cost of permanent work from \$12 a yard to \$5.25 a yard.

Major Gray followed the City Engineer and made a few mysterious passes on a blackboard with chalk. These passes were intelligible only to the engineers, but what the gallant major was driving at was that in the construction of breakwaters and piers, while it would cost but \$3 a cubic yard for wood and stone construction, concrete

would give a job for all time for \$6 per cubic yard. It was shown that twelve feet of wood and stone were not as strong as six feet of concrete, and that by reducing the sectional area, concrete could be utilized as cheaply as stone and wood.

"What is the life of concrete?" asked a voice.

"Well, I know some that has been in existence over 1,000 years, and it is about as good as new."

SUCCESS ON SOO CANAL.

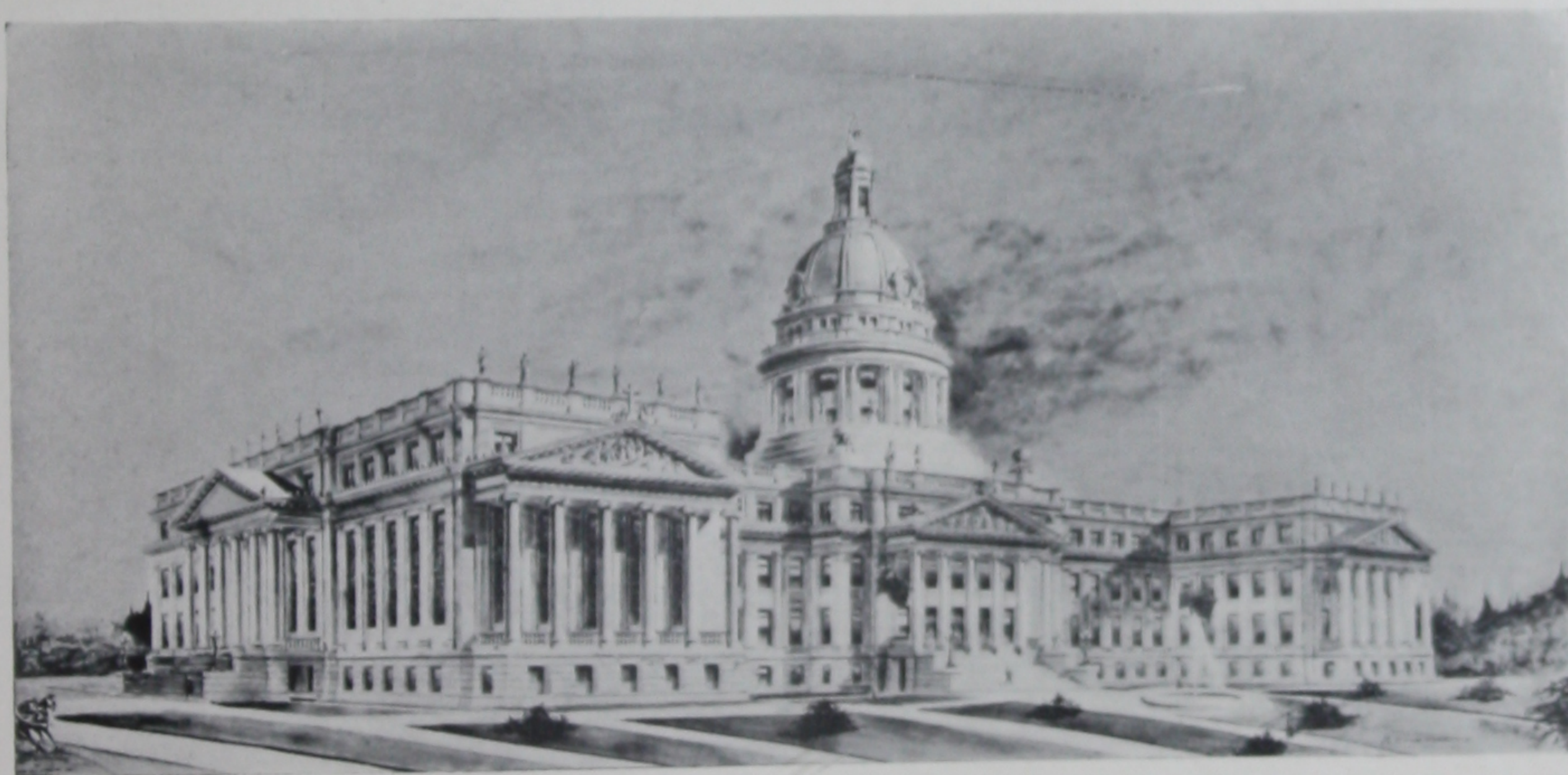
One of the principal speakers of the evening was Mr. M. J. Haney, who from his large and practical experience was listened to with great interest. Mr. Haney said in part:

"I have been for years an advocate of cement in Canada. My experience with concrete for the foundations has been very satisfactory." Mr. Haney then explained the admirable manner in which the concrete has stood the test at the Soo canal, where the foundation carries as heavy weight as any in the country.

In commenting on the great expansion of the cement industry, Mr. Haney compared the progress with strides in steel. He was of the opinion that now builders found that if their great structures were to last, the concrete must give the life to the steel by covering it and keeping it from the action of the air.

Mr. H. F. Duck spoke on the durability of concrete, and instanced a case in Wisconsin where he was interested in the building of a dam 200 feet wide, in which 100 feet of stone was used and 100 feet of concrete. The stone was convenient but the 100 feet cost double the price of the concrete, and is wearing away so fast that it will be torn out and the entire dam built of concrete.

City Engineer Rust rubbed it into the government and railways for neglecting to use Canadian cements years ago, and Major Gray replied that the Minister of Public Work was fully cognizant of present facts, and that as far as practical all works now are being built with concrete and Canadian cement.—*Toronto Daily Star*.



Reinforced Concrete.

Art Building, Ottawa University.

Evidence of a new building era to which the term "absolutely fire-proof" may properly be applied comes to us from across the border. In 1900 a large district of Ottawa was wiped out by fire and three years later the same district was again destroyed, demonstrating the folly of rebuilding upon the then accepted lines. Shortly after this, in December, 1903, the Arts building of the Ottawa University was destroyed, with the loss of many valuable books and documents and at a sacrifice of life and limb, needlessly incurred because of the mode of construction employed. In rebuilding the selection of armored cement concrete for this great new structure was made only after thorough investigation of its superior fire-resisting properties, over all other materials of construction, by the University authorities, who visited numerous points in the United States and personally examined many reinforced concrete structures and especially the ruins of the great Baltimore fire, where the superiority of this form of construction was demonstrated to their entire satisfaction. The new building occupies the site of the old University building. It is pure Grecian style of architecture and bears a striking resemblance to the national capitol at Washington, D. C.

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UNCLE SAM CAN'T GET ENOUGH CEMENT

Irrigation and Other Works Held
Up—Government May Start
a Factory.

Special to The Journal.

Washington, April 28.—Uncle Sam wants Portland cement and wants it badly. With twenty-four big irrigation projects under construction, requiring hundreds of thousands of barrels of cement, the engineers are finding it next to impossible to obtain anything like the quantity needed. The unprecedented demand for this commodity all over the west has already overtaxed the capacity of the mills, and almost without exception the government's requests for bids are turned down. Apparently no manufacturers west of the Mississippi are able to supply new orders. In reply to inquiries from the government they state that, owing to the unusual demand, new orders cannot be accepted for several months to come. Recently proposals were requested from eight manufacturers and dealers in cement for 2,000 barrels required on an Idaho project. Only one proposal was received and that was at a rate 30 per cent higher than the firm would have sold a few months ago. Still later invitations for bids for several thousand barrels were sent to twenty-three dealers. Again but one firm submitted a bid, and this was nearly 60 per cent higher than the normal profitable rate of sale by this firm. Other attempts to purchase cement have been similarly unsuccessful.

The reclamation service is gravely concerned. It has let contracts for structures involving millions of dollars, and a failure to secure cement as needed, entering as it does so largely in the work, will be disastrous. Owing to the inaccessibility of many of the government works, the transportation of cement is difficult and costly. This was particularly the case in Salt River valley in Arizona, where the great distance from existing mills and the expensive wagon haul, made the cost prohibitive. After making thoro investigation of the cost of bringing in cement for the Roosevelt dam and other structures, the government erected its own mill and for several months past has been turning out daily hundreds of barrels of first-class cement at a price far below the cost of cement shipped in. It is known that materials required for manufacturing cement of good quality exist near several of the other projects, and private parties would do well to embrace the opportunity to go into the business. From the present outlook, however, the government seems to have a choice of shipping from the far eastern seaboard or from Europe, or of manufacturing its own cement.

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ULTERIOR MOTIVE IN CEMENT SCARE

Users of Portland Product
State That City Engineer
Thomson Knowingly Mis-
leads Regarding Combine.

Prices Have Not Doubled, as
He States, and Scarcity of
Product Extends All Over the
United States.

STATEMENTS made by City Engineer Thomson and members of the council that a combine exists among the big dealers and manufacturers of Portland cement and that the price of the product has gone up \$2 a barrel in as many months, are asserted to be absolutely erroneous by those in this city who have closely investigated the matter.

The council resolution to bar Portland cement in municipal work here, and the resolutions of the Commercial Club to investigate the situation both as regards cement and steel in the United States and Europe, are stated to be absurd. Not only is the council being imposed on, apparently for some ulterior motive, in taking up the recent mysterious resolution that nobody will father, but builders and architects declare that the city is being injured severely in the East by the efforts of a few people who either do not know the true situation or who are wilfully perverting the truth for some reason best known to themselves.

Protection of local contractors, as well as the finances of the city, is declared by the city authorities to be the reason for the proposed stopping of all municipal contracts requiring the use of Portland cement.

With work in sight for the year requiring nearly 400,000 barrels of the cement, the city faces the situation of paying nearly twice as much for the cement as the contractors figured on after the city engineers had submitted the estimate and the work had been ordered by the council. That this means many thousands of dollars is obvious. Many local contractors figured on work with cement at \$2.05 a barrel. It has risen to \$4 in a few months.

The average contract for street paving let by the city is for a mile in extent. The rise in cement means an additional cost of about \$2,700 per mile for paving, according to the figures of the city engineer's office. Seldom does a contractor make profits on a mile of work even approximating this sum.

"If the price of cement remains at this figure the city must change the character of its paving or go out of business," says City Engineer Thomson.

That there is a shortage of cement is acknowledged by everybody. It is not a local shortage, however, but a shortage

that is felt all over the country. It comes not from any combine," but from the mere fact that the demand exceeds the supply in every portion of the United States owing to the phenomenal growth of the use of cement along all industrial lines. The effort of persons here to create the impression that the shortage is purely a local one; that Seattle has to pay more for cement than any other city, and that an alleged local combine exists, has resulted, builders and architects say, in frightening away capital desirous of investing here.

Resolutions Are Ridiculous.

"For people supposed to be thinking men to go off 'half-cocked' and pass resolutions before making any investigations, thereby injuring the city, is simple hysteria, and perhaps a desire to get into print," said one architect today. "For the city engineer to wilfully run into print with the story of a combine to boost prices on cement and to endeavor to eliminate Portland cement from city work, is convincing proof in the minds of many that he has an ulterior motive that cannot be said to reflect much credit upon him either as an engineer or a truthful man. I believe his public statements about the matter will result in an investigation as to his reasons for inspiring that council resolution that will prove interesting reading when it is completed."

In an effort to ascertain the absolute truth about the cement situation, several local architects and builders—the men that the city engineer says are being so grievously injured through an alleged local combine—got together yesterday morning and wired all the big American manufacturers asking if they could fill a 20,000-barrel order at once, and, if not, why not. These answers were received:

From the Chicago Portland Cement Company: "Useless to quote prices. Unable to supply demand here."

United States Cement Company, Indianapolis: "Can't sell any cement. Have none."

Portland Cement Company, Denver: "Plant working full capacity, but behind in orders. Can quote no figures for quick delivery. Tied up with government contracts."

All United States Affected.

Other cement manufacturers and heavy dealers replied in the same manner. They all stated that every city and town in the United States wanted cement, but could not secure it at once. "The demand exceeds the supply. Plants working to full capacity in effort to catch up with orders—this is the tenor of the word received from all parts of the country by local men."

During the past two years the general use of Portland cement has increased 200 per cent and the manufacturers have been unable to keep pace in the growth of their plants with the growth of the demand. The result is a natural shortage, and, of course, a natural increase in prices. Government work has done much to increase the phenomenal demand. The Portland Cement Company of Denver, for instance, is working its factory at full capacity, merely to supply Uncle Sam with cement for his irrigation ditches.

As far as cement prices go, the statements of City Engineer Thomas appear to be as erroneous as about an alleged combine. Thomson, in a local paper, asserts that the price of cement has gone up from \$2 to \$4 a barrel. This is absolutely denied here. F. T. Crow, of F. T. Crow & Co., stated today that cement in the local market has never been \$2 a barrel. When it came near that figure it was because of a fight between two big local dealers, who cut prices for competitive purposes, and lost money thereby. The price of Portland cement in Chicago today is about normal, although, owing to the heavy

demand, it is slightly in advance of what it was two months ago. Prices quoted in Chicago today are \$2.20 a barrel f. o. b. Chicago. Freight on it is 45 cents a hundred. There are 400 pounds to a barrel, which brings the price to what it is in this city today.

Steel Shortage Erroneous.

So far as the alleged shortage of steel is concerned, that also is erroneous. H. W. Jack, of the American Bridge Company, asserts that there is plenty of steel and that the prices are normal. To investigate the European market on the matter would be the height of foolishness, he says. "If these big railroads could buy steel at one-eighth of a cent less abroad than they can buy it here they would buy it abroad," Mr. Jack declared today. "Yet you don't find them buying much abroad."

The San Francisco disaster has, of course, helped to bring a shortage of cement to this city in addition to the natural shortage. This is but temporary, however. Galbraith, Bacon & Co. have sent The Times this statement:

"Prices on cement, like on all other articles of commerce or manufacture, are regulated by the laws of supply and demand. On the Pacific Coast cement has been scarce for the past nine months. Last fall there were shipped upwards of 50,000 barrels of European cement from Puget Sound to California to alleviate the situation there. This practically cleaned up all old stocks of European cement here."

"The recent San Francisco catastrophe has an important bearing on the situation, as all means of transportation are much disorganized. Vast amounts of cement will be consumed in the rebuilding of the city, and it is doubtful if much relief can reach us from that quarter for many months."

"There are, however, vast supplies on the way to this market. We have over 110,000 barrels of European cement afloat and on the way here. This cement will arrive regularly each month after June. Following is the list of vessels carrying European cement for us now on the way here:

Ship and Brand—	No. Barrels.
Osterbeck—Alsen, due in Seattle June, 1906	15,000
Ascensione—Condor, due in Seattle July, 1906.....	5,000
Italia—Condor, due in Seattle August, 1906.....	22,500
Lucipara—Condor, due in Seattle August, 1906.....	7,000
Villebois—Hercules, due in Seattle September, 1906.....	19,000
Rajore—Mannheimer, due in Seattle September, 1906.....	12,500
Marie—Hilton, due in Seattle September, 1906.....	6,000
Demstaffnage—Condor, due in Seattle October, 1906.....	17,500
Marthe Roux—K. B. & S., due in Seattle October, 1906.....	10,000
Total	114,500

"In addition we have a contract calling for 8,000 barrels per month of Standard cement from California, which amounts to 64,000 barrels more yet to come this year. This Standard cement will be supplied to the largest city contractors at not over \$3 per barrel. Many of these larger contractors have already engaged cement at this price and less which will carry them through the summer."

"Other dealers have correspondingly large amounts of cement on the way here. It is reported that Balfour, Guthrie & Co. alone have chartered six steamers which carry full cargoes of cement for the Pacific Coast."

As a matter of fact, more cement is now en route to Puget Sound by rail and water than ever before in the history of the country. On Portland cement there is no combination of dealers to raise prices in Seattle. There is no corner.

"The advances in price have been gradual and have been made with due notice to dealers, contractors and consumers by manufacturers on the Pacific Coast, in Europe and in the eastern part of the United States."

CONCRETE IN CINCINNATI.

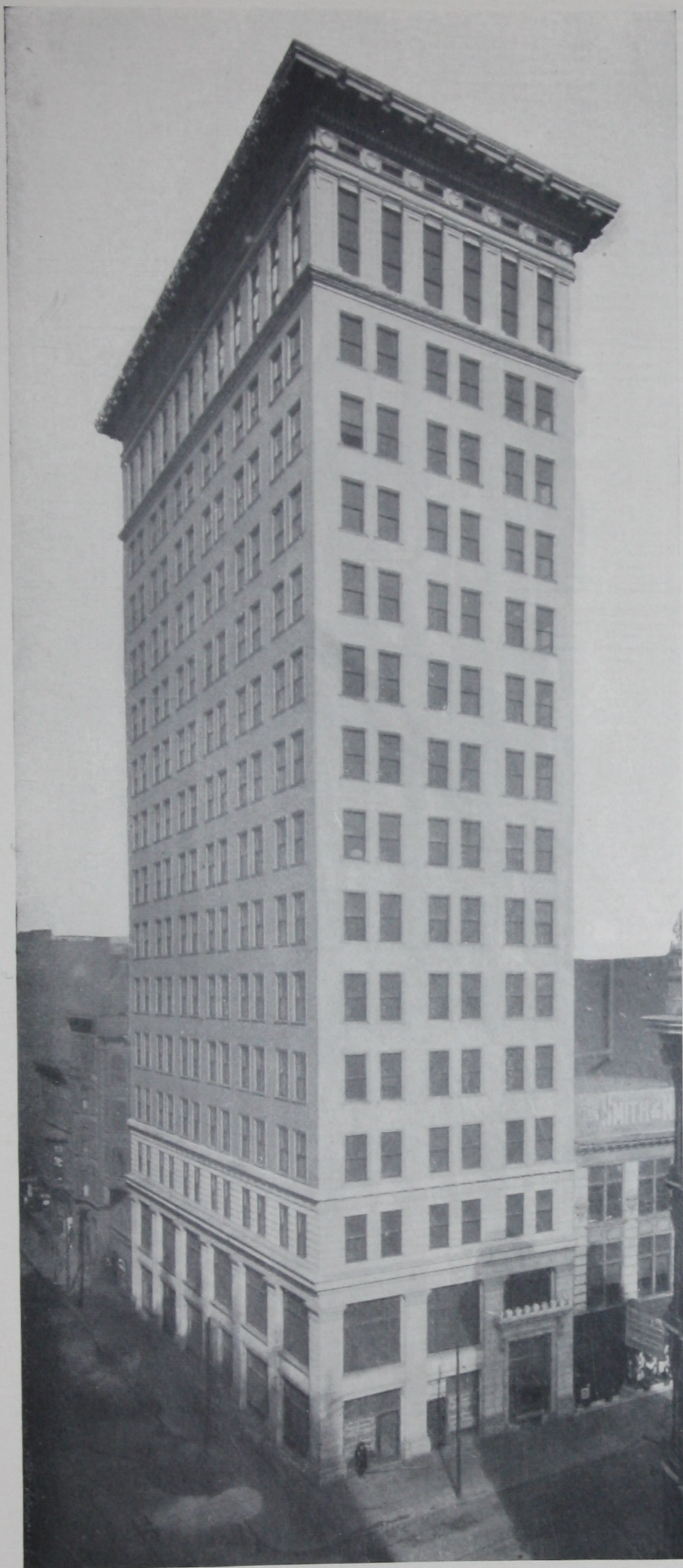
"Concrete is King" in Cincinnati. Since the advent of the Ingalls block and the Pugh Power building, concrete has superseded all other forms of construction. The city has experienced a boom in building operations and almost every large structure has employed concrete very largely, while a majority of them have been of concrete construction throughout.

There is at the present time no less than twenty large buildings in course of erection, all of reinforced concrete construction. The Cincinnati Southern depot is perhaps the most notable, a structure three blocks in length, 1,150 feet, and 150 feet wide, costing about \$250,000. Several others are for mercantile purposes, covering a large floor space, and eight and ten stories high, costing \$100,000 and upwards. A new million dollar hotel building is under way which is to have a steel frame, every part of which will be encased in concrete.

The building for the Bullock Electric Co. is another large structure, and especially interesting from the fact that it was originally designed for steel construction and requiring at least six months before steel could be placed. It was afterwards decided to use reinforced concrete, and the Ferro-Concrete Construction Co. secured the contract, guaranteeing to complete the job in ten weeks.

The Union Savings and Trust Building, Twelfth and Vine streets, Cincinnati, Ohio, is one of the recent achievements in concrete construction. The foundation, walls, framework, floors, partitions, etc., are of reinforced concrete. The front and all ornamentation is artificial cement stone, that part of the structure alone being a contract for \$5,000.

This is a fine example of the modern bank building and fully demonstrates that concrete is a most desirable form of construction for even the most elaborate twentieth century architecture. The building was erected by the Ferro-Concrete Construction Co., and the cement art stone furnished by the Architectural Stone Co., of Cincinnati. The entire structure cost about \$150,000. Designed by Gustave Drach.



The Ingalls Skyscraper Office Building, Constructed Entirely of Portland Cement.
The first building of its kind erected in the United States.

Architects
Elzner & Anderson

Contractors
Ferro-Concrete Construction Co.

Built in 1903, this great structure was such an innovation that Building Inspector Tooker required much time and investigation before granting a permit. The Ingalls building is a conspicuous monument to one of Cincinnati's multi-millionaires, M. E. Ingalls, President of the Big Four Railroad. It is a solid structure of artificial stone which grows more solid as the years go by. It is constructed entirely of reinforced Portland cement concrete with embedded steel rods, no structural steel whatever being used. This form of construction is very strong and durable, so much so that the retaining wall, instead of being three or four feet thick, is less than one foot in thickness. Such a structure, instead of growing discolored with age, assumes a creamy whiteness that continually adds to its appearance. This building, 210 feet high, 16 stories above the street level, was erected in 198 days. Each story, as its forms were removed, was ready for the immediate installation of all the finishing materials. Each floor, with the columns and walls of the story below, was built complete in 2 days. Three stories of forms were used to enable the concrete of each story to remain 21 days before the forms were removed. This pioneer example of Portland cement concrete skyscraper construction has proven superior to all other methods, with the result that an entire revolution is now taking place in building, and cement concrete leads the world.

The Largest Reinforced Concrete Building in the United States.

We illustrate a prospective view of the new armored concrete, fireproof power building, 68x335 feet, and nine stories high during construction on Pike and Fourth streets, Cincinnati, Ohio. The footings, walls, columns, girders, beams, floors, roof, pent houses, tanks, partitions, hot air ventilating ducts, as well as shafts, chimneys and stairs, are of reinforced cement concrete. Not a particle of wood, brick, or structural steel is used in the building. All window frames and sash are metal, and glazed with wire glass. This construction is designed to be the most incombustible building ever constructed.

The retaining walls are only 6 inches thick, made possible by reinforcing the pilaster to withstand the bending movement produced by the earth pressure.

The columns are spaced 20 and 23 feet from centers in one direction and 14 to 17 feet in the other direction.

All floors and girders are figured to carry 230 pounds per square foot. The cost of the building complete will not exceed 7 cents per cubic foot, for which price it would be impossible to construct such a building in the so-called mill construction. Therefore, capitalists who can grasp the economy of armored concrete construction, will be able to erect fireproof buildings instead of firetraps for the same capital invested. Mr. A. H. Pugh, being an engineer, was enabled to see at once the great economy of reinforced concrete construction and therefore adopted it. Messrs. Diltoe and Wisenall are the architects. This firm have likewise designed the reinforced concrete Blymyer building of Cincinnati, Ohio. The concrete in the Pugh building is being done by Messrs. A. Bentley & Sons of Toledo, O.



View of the new armored concrete, fireproof, power building, 68x335 feet by nine stories and basement, during course of construction by the A. H. Pugh Printing Co., Pike and Fourth Streets, Cincinnati.

The Greatest Beam in the World.

A concrete support 102 feet long, is described in a recent article in the Los Angeles, Cal., Express. The beam in question forms a part of the support to the roof of a new warehouse which is being erected in Los Angeles. The building is entirely of concrete and the beam mentioned is claimed to have been the longest so far ever built of concrete. While it is 102 feet long, it is less than two feet in thickness. The beam is reinforced by six iron bars running through its entire length. A test of one of the beams was made by E. S. Codd, chief engineer of the Pacific Electric Ry. who took an accurate measurement of the settling as the supports were removed under it. This settling is declared to be less than .68 of an inch. Many engineers of the Pacific Coast witnessed this test.



IN the upper picture is shown the seven story reinforced concrete Hauck Building, Cincinnati, Ohio, constructed in 1904 by the Ferro-Concrete Construction Co., engineers, Jacob Roeckert being the architect. This entire structure is composed of Portland cement concrete and twisted steel rods—being absolutely fire, vermin and time proof. The girder span in this building is 21 feet. The specified load to be carried is 62,000 lbs., but on tests made with double the load, 124,000 lbs., for five days the deflection was but 7-64 of an inch, equal to 1-2300th of span. Each floor forms a perfect roof, under which all plastering, piping, wiring and interior finish proceeded, whereby much time was saved over other forms of construction. This was the first building ever comfortably occupied when only half completed, each story being finished separately while the work progressed above without delay. The cost of this building was considerably less than ordinary steel and tile construction. It will last forever, requiring no repairs. The advent of such buildings is fast developing a new era in construction throughout the world. Every progressive architect and engineer is today studying this form of construction and it means without doubt a tremendous consumption of Portland cement in the future along this line. Portland cement is very properly described as the "Sampson" amongst building materials.

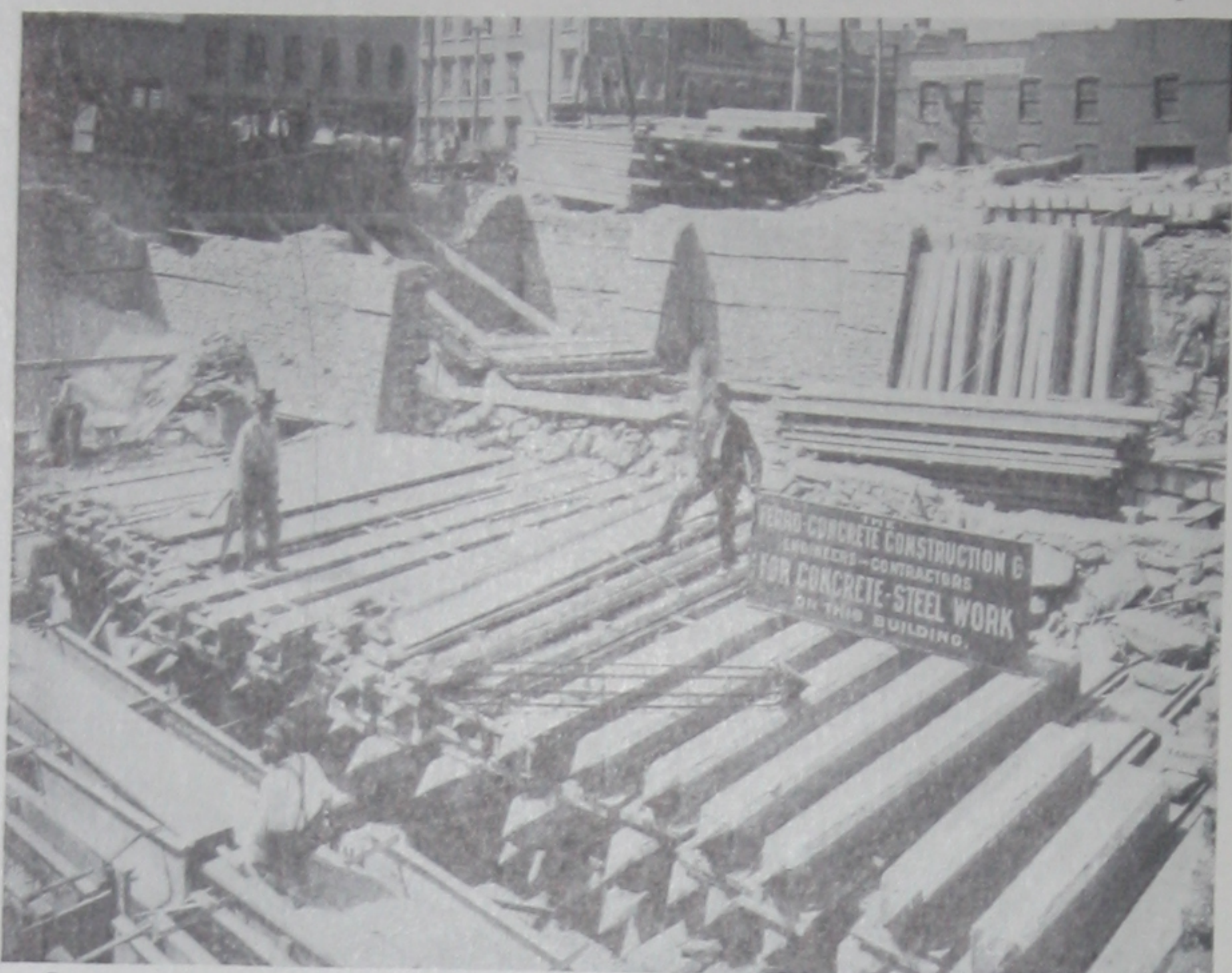
Sky-Scrapers of Cement.

For once that veteran inventor, Thomas A. Edison, has assumed a new role—that of prophet. Cement and steel he declares are to be the building materials of the future. Sky-scrapers will be built of frame-work of steel with walls of Portland Cement, the steel work encased in cement as well.

Some of the fire insurance people will go out of business, so far as building risks are concerned, or write risks on the balance of what will be then obsolete buildings.—*Cement and Engineering News*, April, 1902.



In the lower cut is shown the new concrete factory of the American Book Company, Cincinnati, Ohio, 365x170 feet, built in 1904, Elzner & Anderson, architects. All foundations, columns, girders, beams, floors, roofs and stairs are of Ferro concrete. No structural or cast iron whatever. We quote the following from W. B. Thalheimer, General Manager of this building. "Our printing office proper is a room having nearly 21,000 feet of floor space and built with a carrying capacity of 400 lbs. to the square foot. We are running in it 25 presses, most of them weighing about 13 tons and have ample space for additional machinery as it is required. There is practically no vibration in this building, none perceptible when standing by the presses and no vibration whatever in the columns or walls. The building is in this respect superior to our expectations and we have no hesitancy in saying that a building properly constructed of cement concrete is an ideal one for machinery in motion. We are very glad that we decided on a concrete structure."



Concrete piling of the Ferro Concrete Construction Co., ready for use beneath the concrete foundations in the great Ditman building of Cincinnati, O. These piles were driven in the ordinary way, some of them receiving as many as 400 blows with the pile driver.

Concrete construction has solved one of the most difficult problems in the erection of large buildings, and the method now almost universally employed for substructures is what is known as concrete pier foundations. Shafts are sunk in some instances to the depth of 85 to 100 feet, to solid rock, and the wells filled with concrete, which in turn forms piers.

Since the down-town section of the city of Chicago is underlaid by a bed of soft clay 60 to 100 feet deep, which affords merely a "floating," inadequate foundation for heavy buildings, this method of construction is especially applicable.

Among the notable buildings constructed in this manner in Chicago are the new Tribune and the First National Bank Blocks, the Schlesinger & Mayer and the Marshall Field stores and the new Railway Exchange Building, which is perhaps the best type of office



View showing beam and girder forms ready to be filled with concrete and the completion of the floor about to be accomplished.

building west of New York. The advantage of concrete piling over other forms of concrete foundations appears to have been clearly demonstrated.

There are several methods used in constructing this style of foundation and a great many patents recently taken out for concrete piling. Because of the great adaptability of concrete, builders are not confined to one mode of construction. They may either manufacture reinforced piling and drive them, as in the case of timbers, or may put the concrete in position in the shafts, which is the method now growing in favor.

The RANSOME & SMITH CO. are erecting a group of seven reinforced concrete buildings for the Vanderbilt Realty Company at Despatch, N. Y. The buildings will be used by the Foster-Armstrong Piano Company.



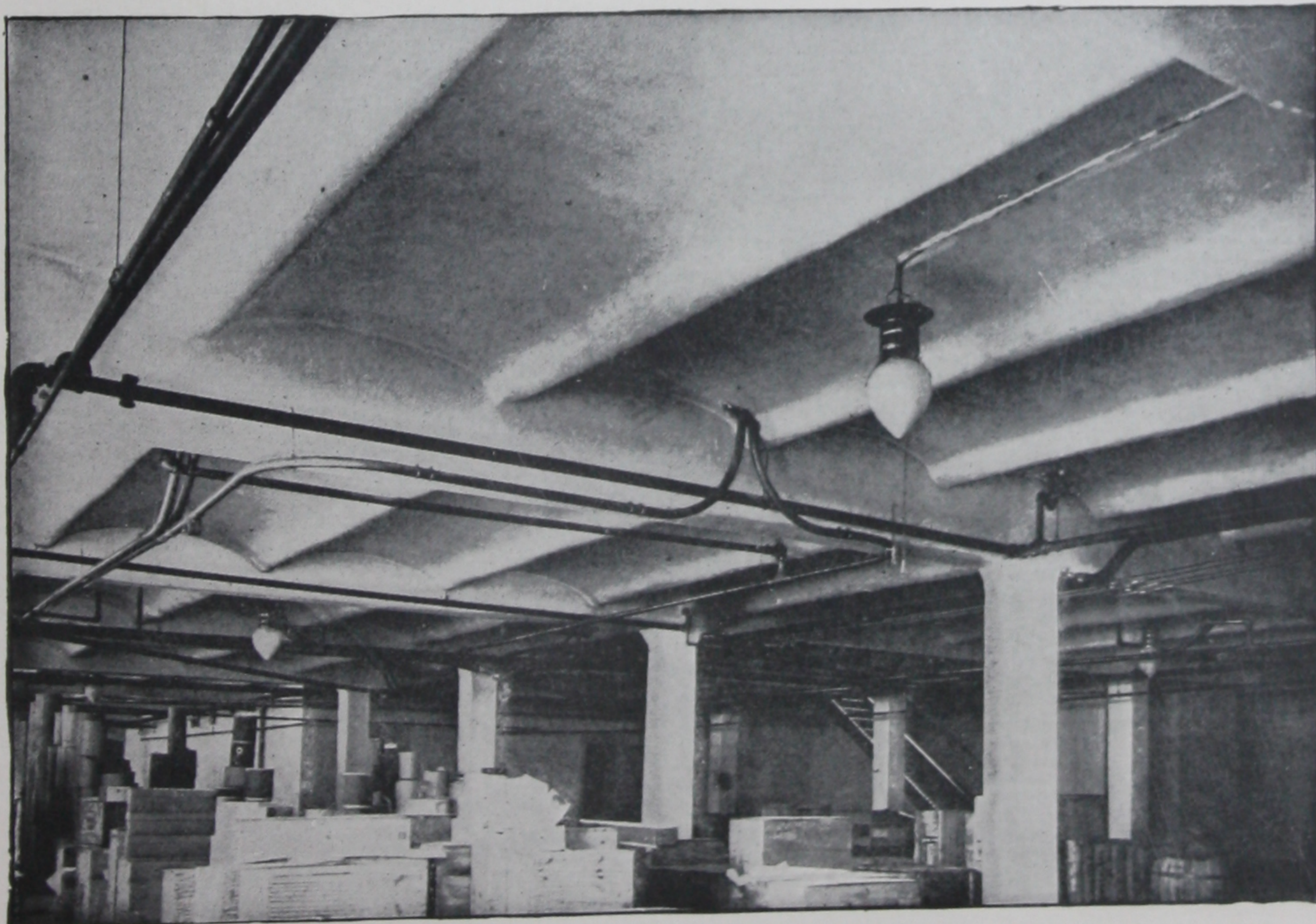
Cotton Mill at Lille, France.

This construction one of the first made in Armored Portland Cement Concrete, Hennebique System, is very deep and large, and needed plenty of light, and for that reason was established simply by a skeleton in Armored Cement Concrete, and the exterior walls instead of being either in brick or in concrete, were formed largely by the windows.

What is remarkable in that construction, which is of comparatively small dead load, is, that although it is provided with engines producing very considerable shocks, no apparent vibration is to be noticed.

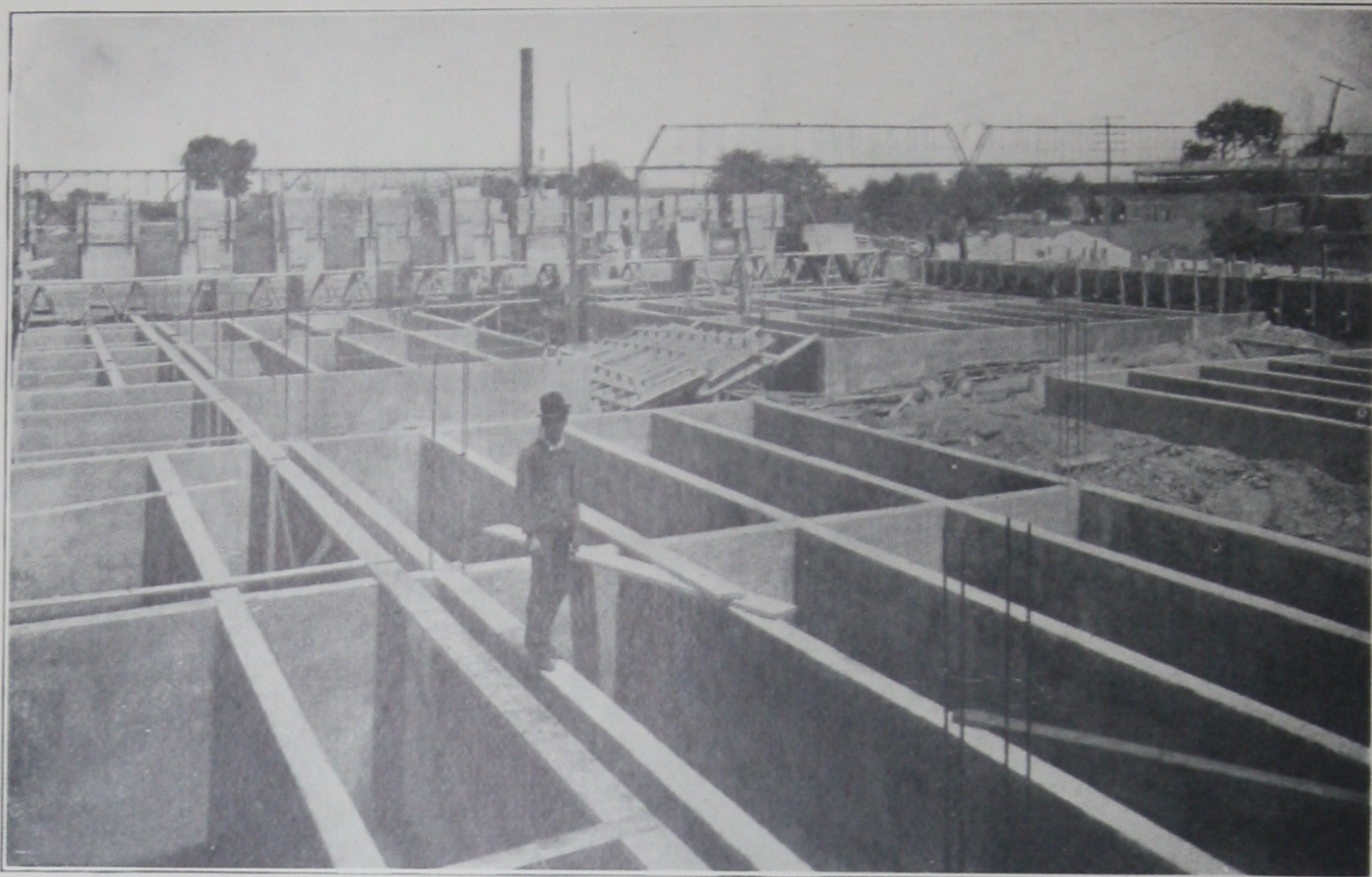
FIRE PROOF.

Recent reports of building construction in Rochester, Toronto, Baltimore and San Francisco, all of which cities suffered from most destructive fires show conclusively the preference for concrete construction, thus testifying to the value of that material during the large conflagrations. The Manufacturers' Record of Baltimore published a very interesting article on concrete in the Baltimore fire, which gives a long list of buildings which are now being erected in concrete and reinforced concrete.

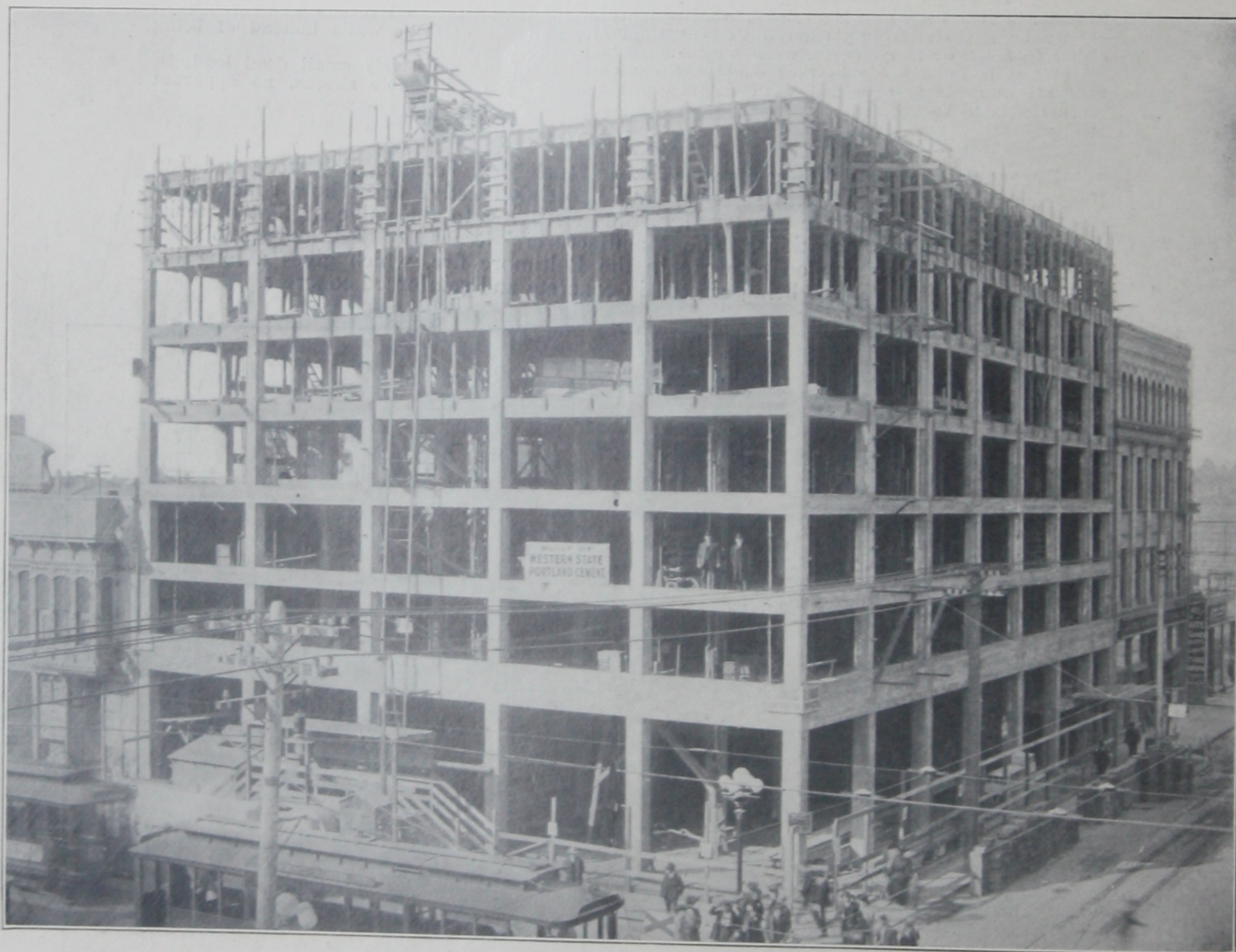


Interior View of Portland Cement Warehouse.

This form of construction is especially adapted for warehouses and factory buildings where provision must be made for heavy loads.

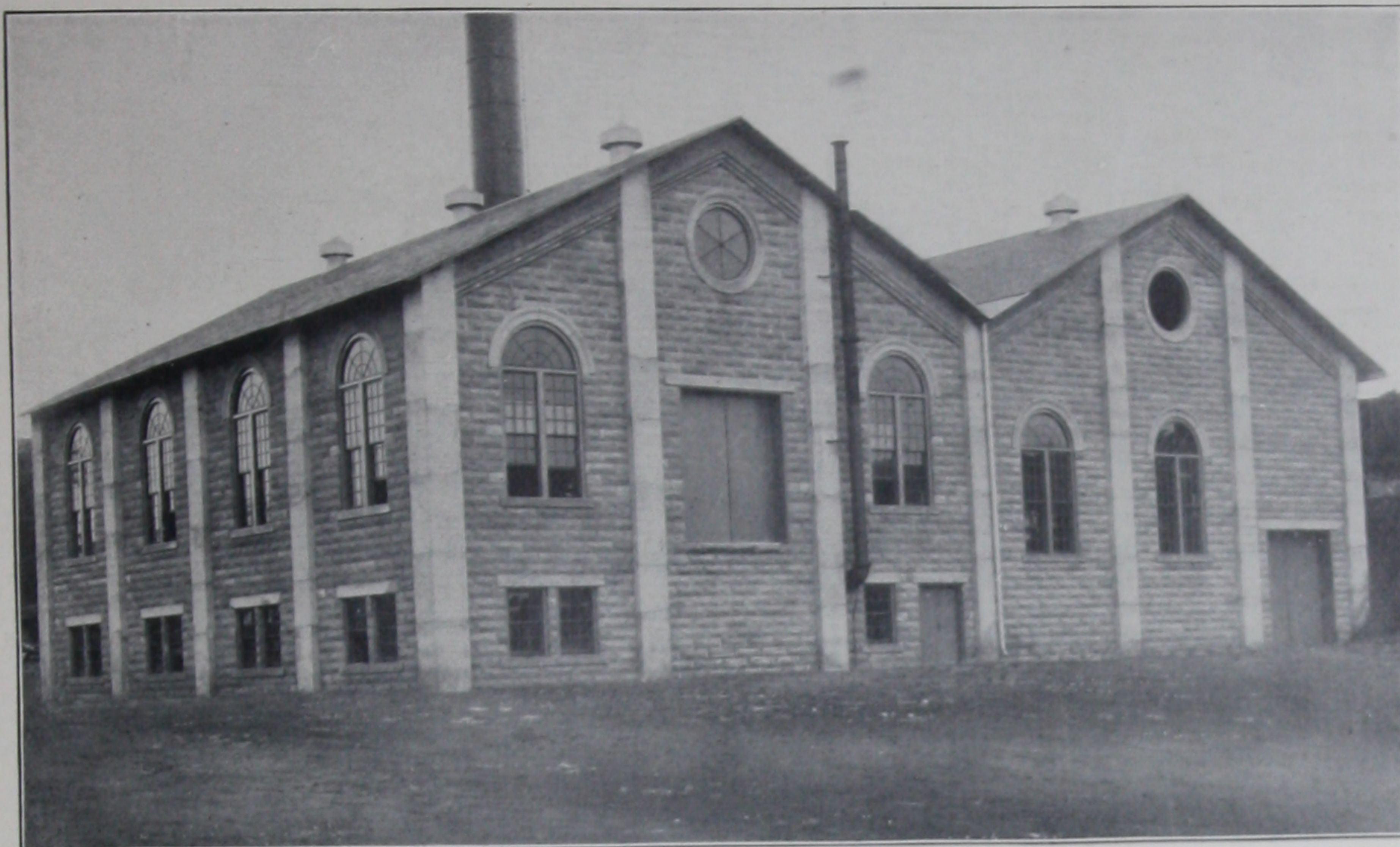


Concrete Tanks Sugar Manufacturing Co., Cairo, Ill
Ransome system concrete construction employed.



New Hotel Hawyard, Los Angeles, Cal.

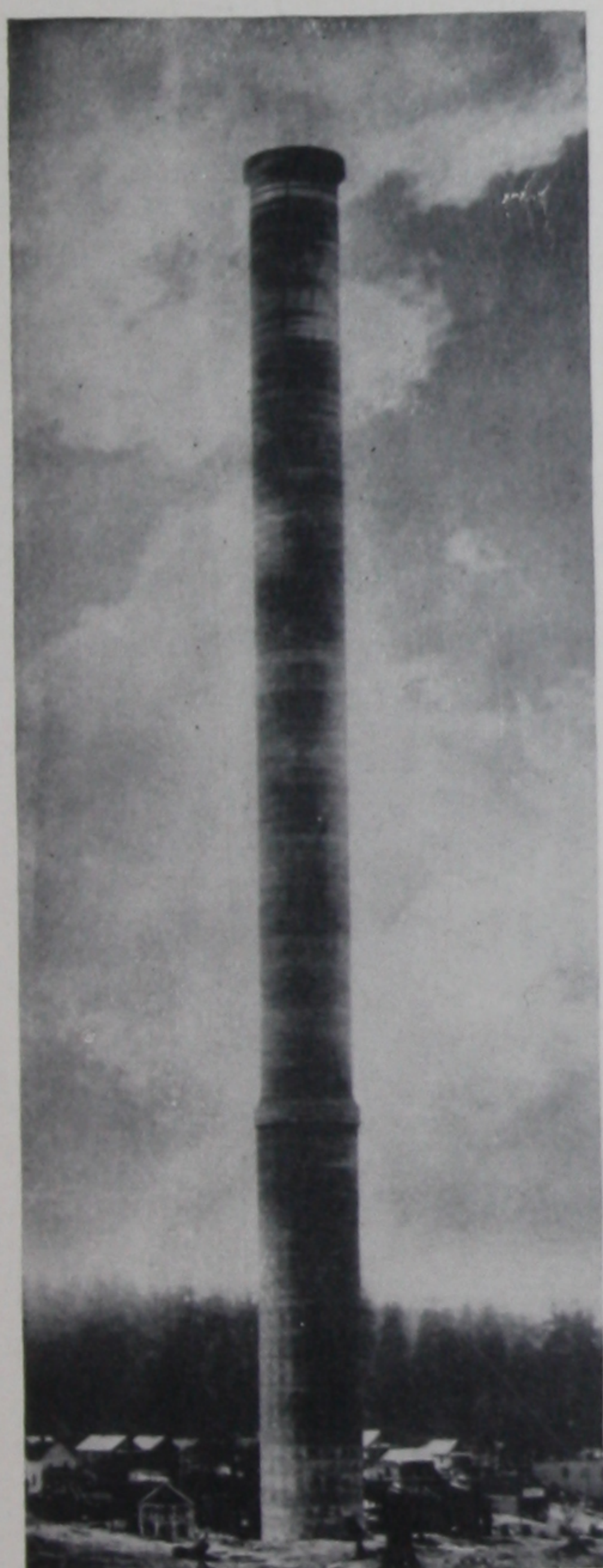
Under construction by Messrs. C. Lonardt & Co., the well known concrete contractors of Los Angeles. The building is to be 9 stories high and 82x109 feet. All the "timbers" are concrete of a very superior quality made of the Western States brand Portland cement. The hotel will be of handsome design and finish and is the first building of any magnitude made entirely of Portland cement that has yet been built in California, or on the Coast. Southern California owners, builders and contractors are rapidly "falling into line" regarding the practicability as well as the economic use of concrete as a building material. The popularity of this material is constantly increasing and the field of its usefulness widening.



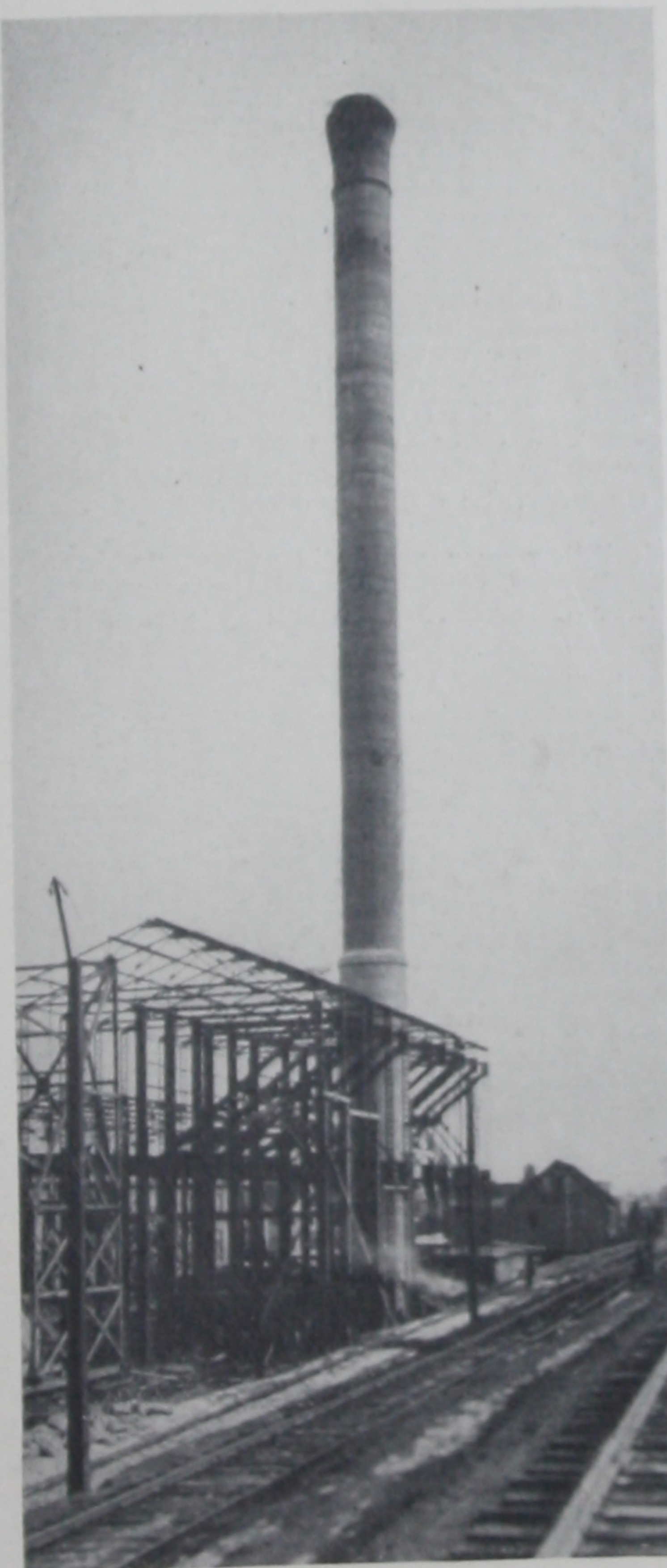
Exterior view of Power House, National Portland Cement Co. Entire Construction Peninsular Portland Cement.

A High Concrete Chimney.

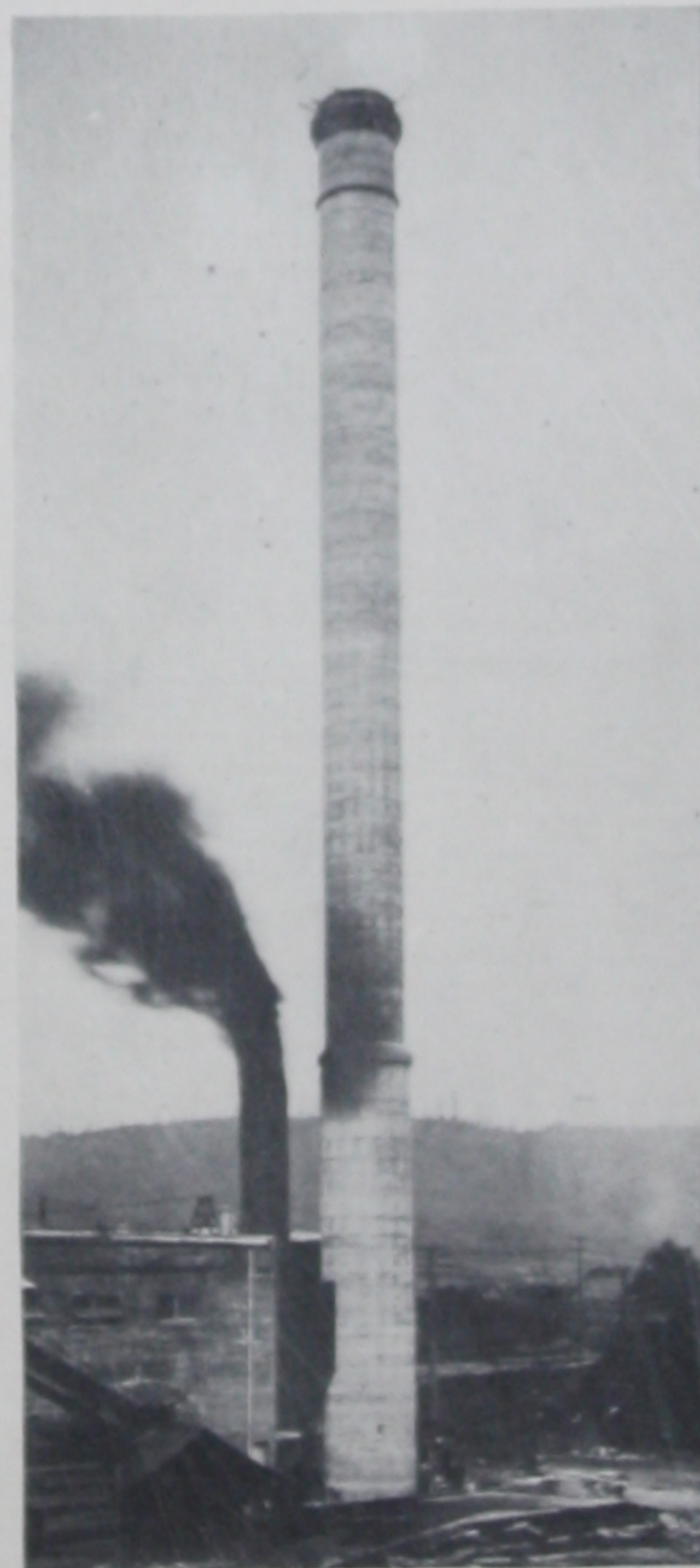
The Butte Reduction Works of Butte, Montana, has just completed a concrete chimney, 354 feet high. 1,600 barrels of Portland cement were used in its construction. It has an interior diameter of eighteen feet throughout. The foundation is forty-two feet six inches square. The entire structure weighs 1,500 tons.



American Smelting & Refining Co.,
Tacoma, Washington.
Height 307 feet x 18 feet inside diameter.



Arlington Mills,
Lawrence, Massachusetts.
Height 250 feet x 11 feet inside diameter.



Portland General Electric Co.,
Portland Oregon.
Height 230 feet x 12 feet inside diameter.

The above are among the largest concrete chimneys in the world and are built according to the "Webber System." The materials used are sand and Portland cement reinforced with "T" steel bars. Concrete chimneys are very substantial and economical in construction as well as in maintenance, as no repairing or painting is needed; and are a substantial ornamentation to any industrial plant. 6 to 8 feet per day is about the progress of construction.



Ferro-Cement Concrete Warehouse the Co-operative Society, Limited,
at Newcastle-on-Tyne.

This building rises to a height of 120 feet, and consists of basement, ground floor and six upper floors. The ground at the site of the building was of the worst description imaginable for foundations, and this entire structure rests on a "raft" of ferro concrete, which covers the whole area of the ground. This raft measures two feet six inches in its thickest part and only seven inches in its thinnest part, and the idea of sinking piles or cylinders for foundations was thus abandoned, it being found that the ferro concrete "raft" system would effect a great saving, both in cost and time. The columns, floors, walls and all are of ferro concrete. The walls of the basement are only eighteen inches thick, while the walls of the ground floor are only twelve inches thick, and they are gradually reduced, until the thickness at the roof level becomes only four inches. The ferro-concrete beams carrying the floors are mostly twelve inches deep by seven inches wide, and the floors are seven inches thick, their span being fourteen feet six inches. The strength of these floors has been tested up to four tons per square yard by means of ninety-six tons of pig iron gradually applied on a square measuring fourteen feet six inches. The severity of this test will be recognized when it is remembered that the heaviest locomotive in use in this country weighs, with its tender, less than ninety-six tons, and could therefore be supported on a space fourteen feet six inches square of any floor of this building.

The strength of this building as a whole is enormous, inasmuch as the sills, floors, walls and roofs are all, so to speak, tied together, and the whole forms a sort of huge monolithic structure which cannot suffer deformation from any strain it may be called on to undergo.



Hotel Gallia at Cannes.
Entirely built in ferro-cement construction.



Bank Building in Leipzig, Germany.

This building is constructed entirely in Armored Cement Concrete, Hennebique System, viz.: floors, columns, footings, roof (which is in cinder concrete), as well as the walls are all constructed of Portland Cement.

PORTLAND CEMENT is the finest non-conducting fire-proof material ever produced. It is as nearly impervious to heat as anything ever discovered. It costs only about one-half in fuel to heat a large residence so constructed than if it had been built in the ordinary way.—*Detroit Tribune*.

SKYSCRAPERS IN DANGER

A Boston Professor's Note of Alarm Over Building Methods.

Boston, March 14.—Every skyscraper and large office building here is in danger of collapse, according to the statement made by Professor Charles L. Norton of the Massachusetts Institute of Technology, today. He says the corrosion of steel, and the consequent weakening of the structures, because of the ineffectiveness of some of the preparations used to protect the metal, should be carefully considered by builders. He condemns stone work and terra cotta as being ineffective against fire, and says concrete is by far the best protection for structural material against flames.



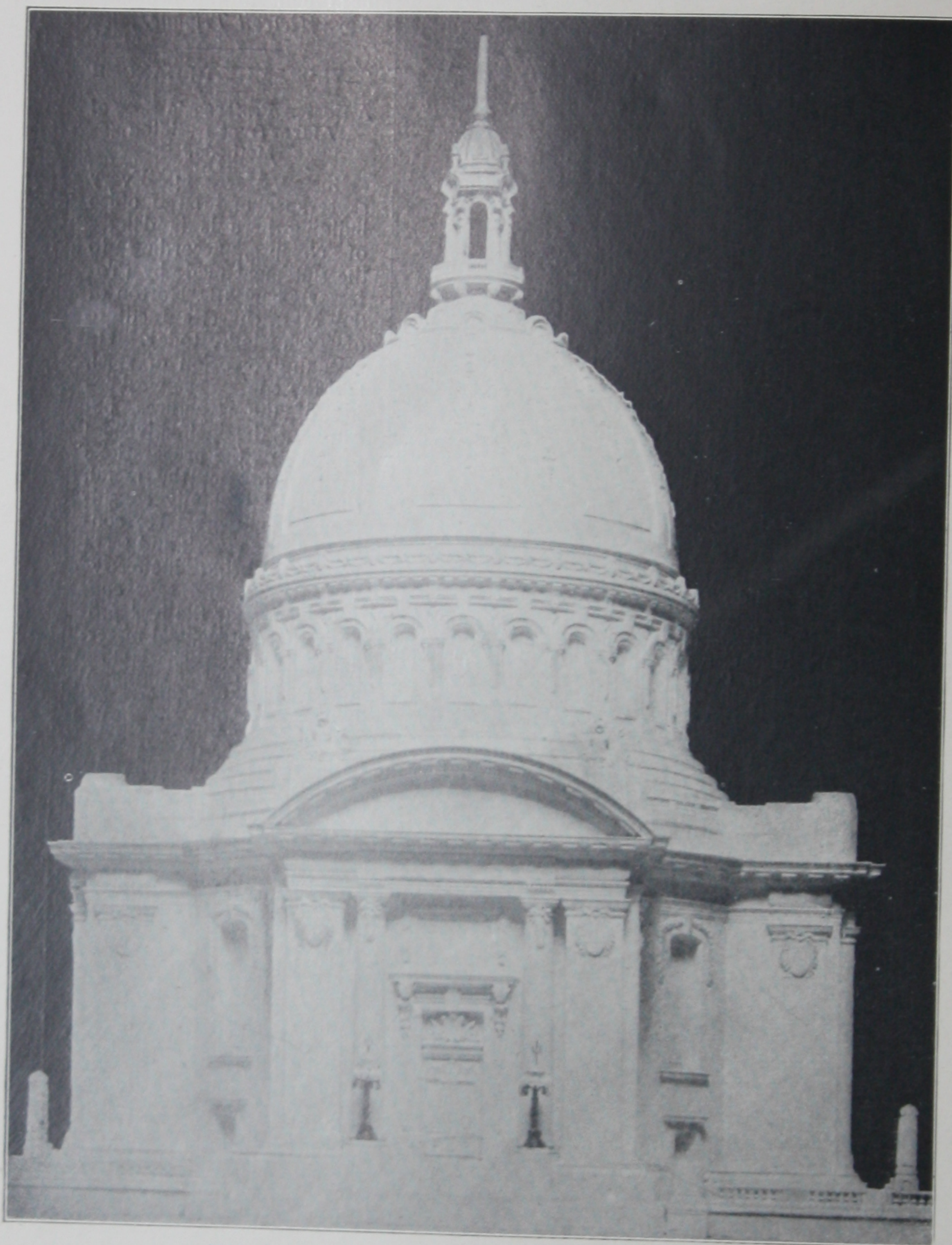
Punahow Preparatory School Building, Honolulu, H. I.

Built entirely of Portland Cement concrete. Dimensions, 145x83 feet. Walls are 12, 10 and 8 inches thick.

It is interesting to note that the building authorities of the islands of the far Pacific have shown a capacity to grasp progressive ideas in general building construction in so creditable a manner as is illustrated by the erection of this important building entirely of cement concrete. Among other important buildings erected in Honolulu of this material are the Automobile Building, 80x200 feet, in general measurement, and the Club Stables, 72x56 feet.

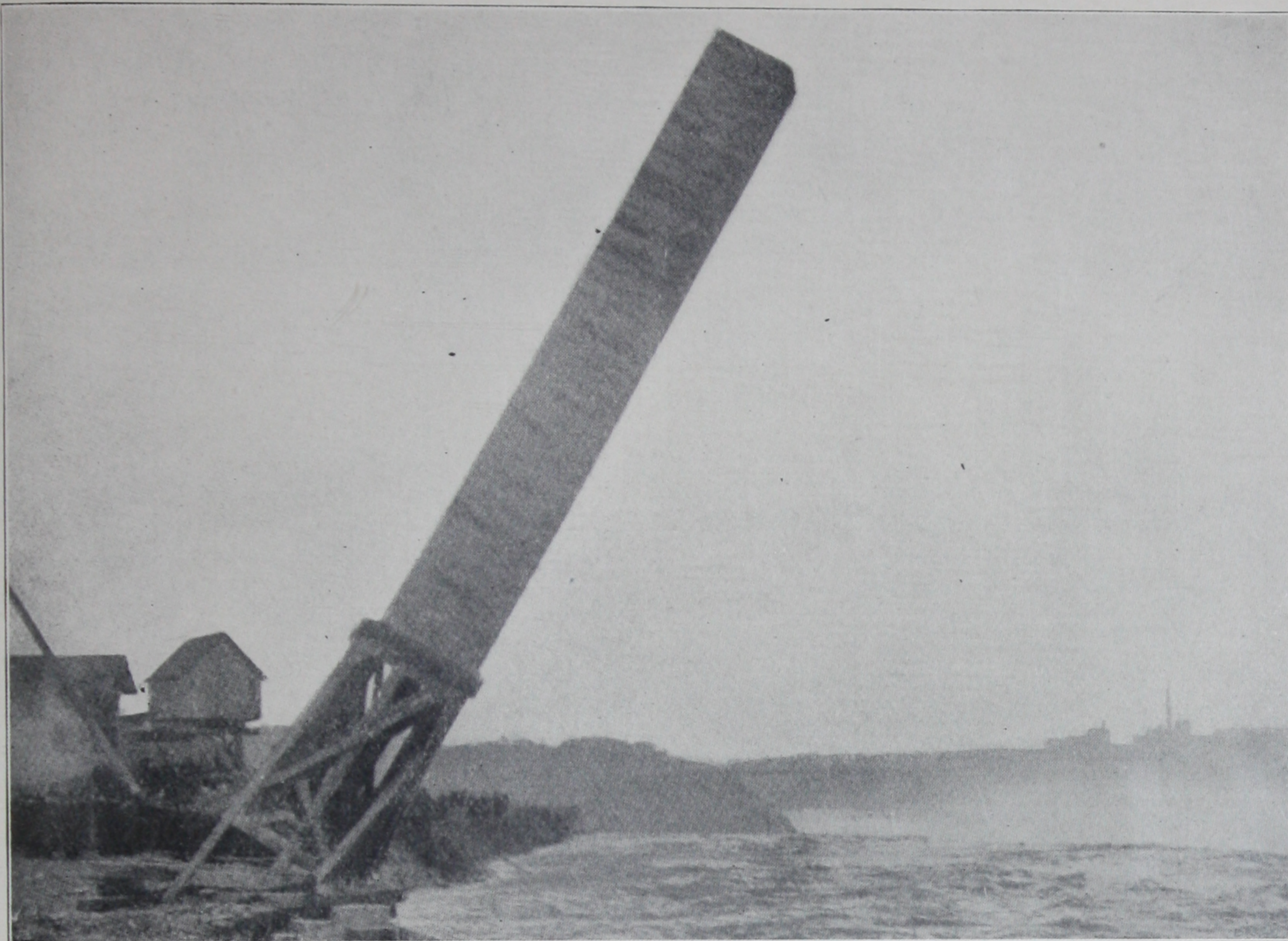
THE ISTHMIAN CANAL.

"The cement manufacturers, it appears, have not yet waked up to what the building of the Isthmian Canal means to them. The construction material that will be required is almost beyond calculation. The canal will have huge blocks of concrete masonry which will require hundreds of thousands of tons of cement. The facing of the canal, the foundations and walls of electric light, power and storage plants, of naval stations, army barracks, and forts, sea walls, dams, breakwaters, piers, docks, jetties, and marine dry docks will require cement in such quantities that will give fortunes to manufacturers. And what will be particularly gratifying to the fortunate contractors, is the fact, that they will be furnishing the material to the government, which has the credit of the world back of it. Would it not be well for our manufacturers to 'get a move on' in time and endeavor to share in the good things soon to be offered to the public."—*Cement and Slate, Sept., 1902.*



United States Naval Academy Chapel, Annapolis, Md.

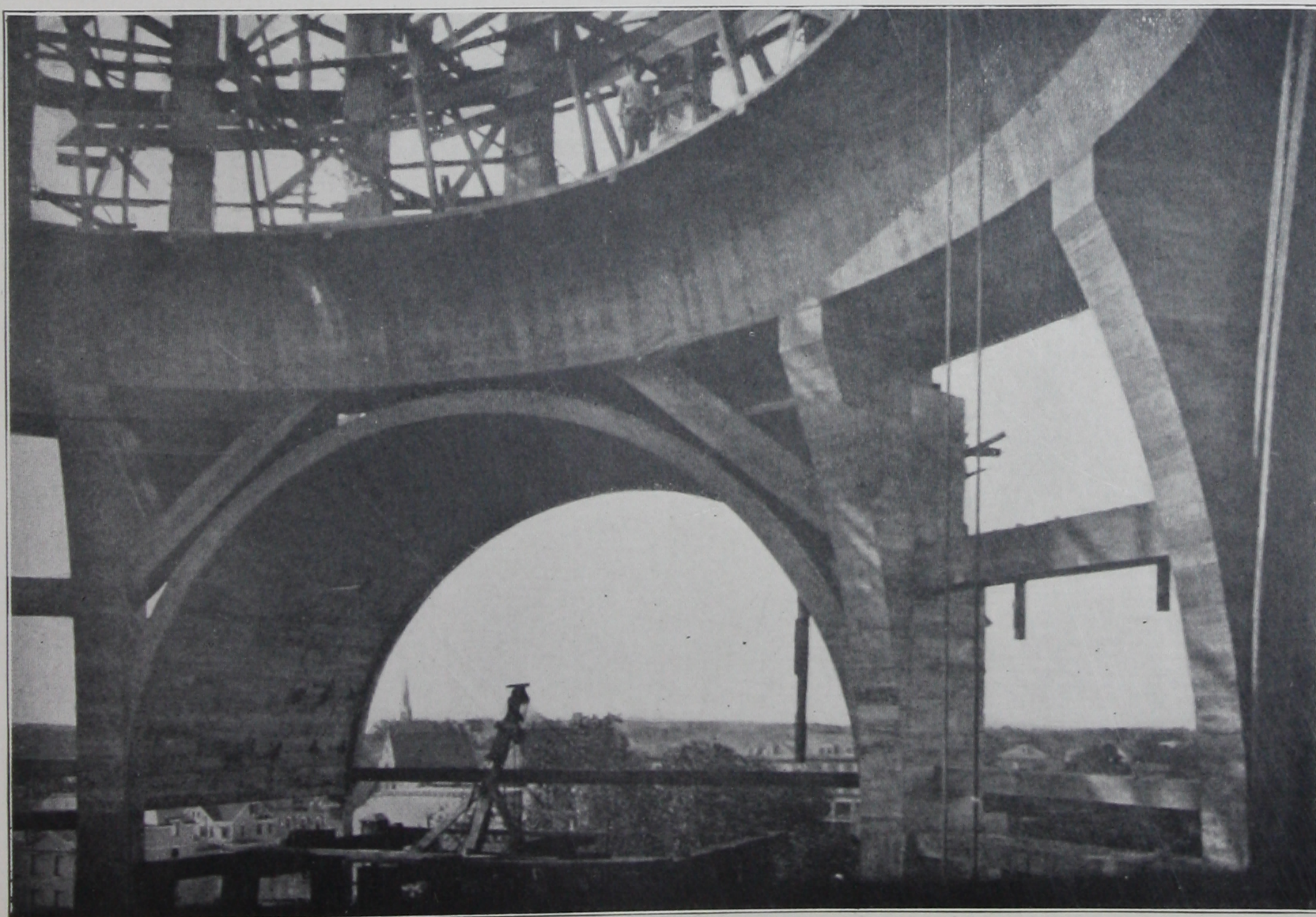
One of the most interesting examples of the use of concrete in building operations. The Chapel affords the opportunity of demonstrating all the value of concrete-steel construction in a most thorough and perhaps also a most novel manner. The dome shell, the roofs of the wings, piers and columns, the entire bracing, floors and their supports, are constructed entirely of reinforced Portland cement concrete. The advantages of this style of construction are many and of an important nature, comprising the characteristic advantages of concrete, its economy, durability, and fire-resisting qualities, as compared with a skeleton construction of steel. Recent events have, beyond a doubt, added to the volume of evidence against unprotected steel in building operations. The disastrous effects of fire upon steel frame have been chronicled alike both in the general and technical press, and need no further mention here except to add emphasis to the wisdom of employing concrete construction in its stead. The feature of the design for this Chapel was building the dome and the four arches over galleries in reinforced concrete and carrying that total load practically on the foundations by means of reinforced concrete pillars, thus, the walls have no load to carry and could be built hollow which would diminish the weight and expense of the construction.



Stemming Niagara with Concrete.

View of the Concrete Tower at the moment of its fall, Nov. 9th, 1905.

One of the most unique engineering feats of recent years. A concrete column rising to a height of 70 feet successfully overturned, falling into the river within 600 feet of the brink of the Horseshoe Falls in order to raise the water at the intake from which the city of Niagara Falls and Niagara Falls Park and River Railway both take water. At this point the course of the river sends the water whirling against the shore and owing to the power of the current the practical, but unusual method of building such a dam was decided upon and proved a complete solution of the problem. The fallen dam makes a pocket as it were and the river flowing around this obstruction backs up, causing a rise of about 10 inches at the intake.



Concrete Construction Inside of Dome, United States Naval Academy, Annapolis, Md.

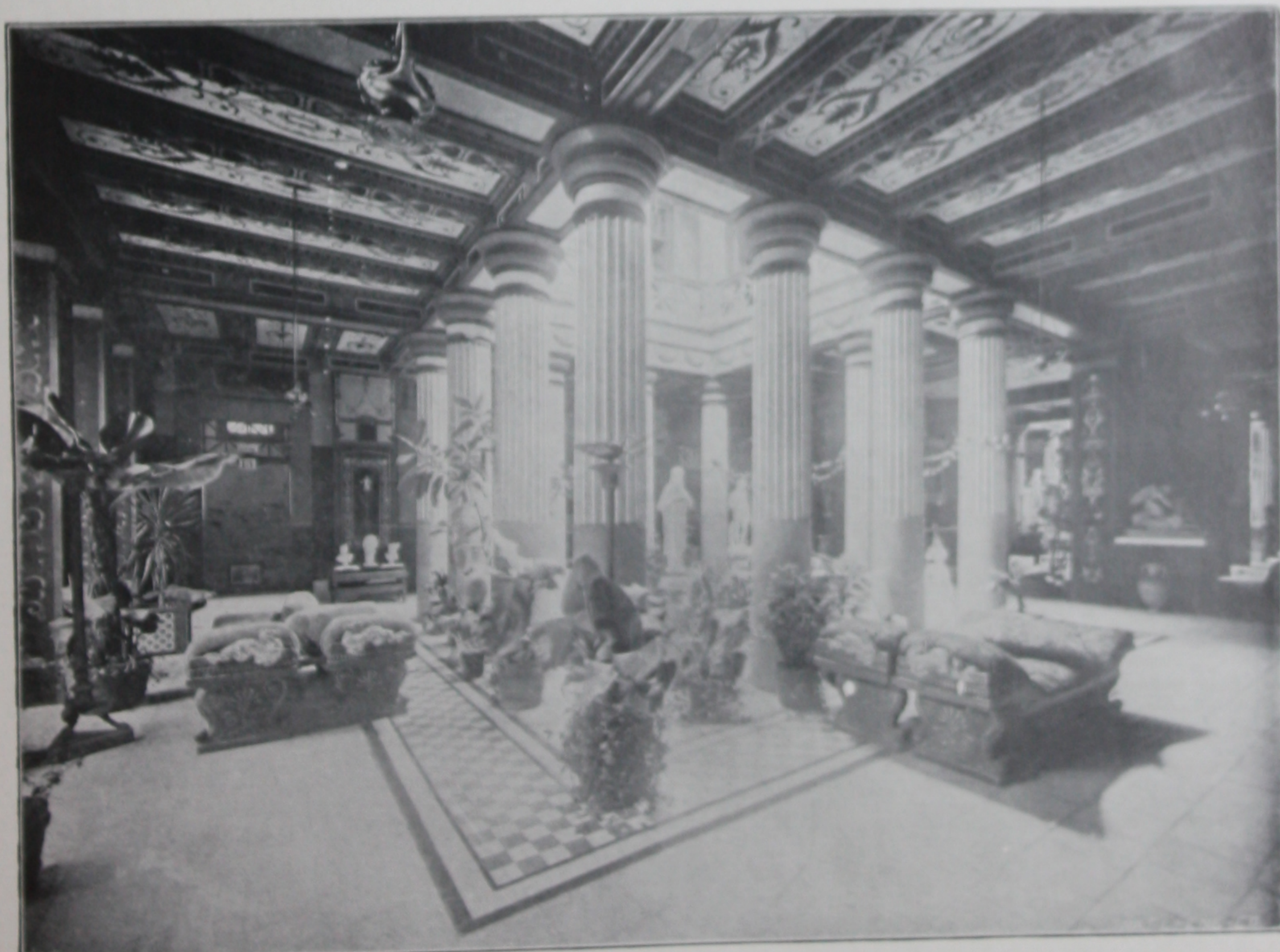


Portland Cement Concrete Buildings of the Canadian Bank of Commerce at Toronto and London, Ontario, and Brandon, Manitoba.



Office Building, Buffington, Ind.

The strongest possible proof of the artistic value of concrete block construction. Exterior is built of cast cement stone, interior, columns, beams, stairways, floors and roof being reinforced concrete, and the partitions hollow concrete blocks.



Peristylum in the Pompeia at Saratoga, N. Y.

The floors, walls, pillars, architraves, etc., all made out of Portland Cement, have had seventeen years' wear, and are as perfect to-day as when completed in 1889.



Nassau County Court House, Mineola, Long Island, N. Y.

ONE OF THE MOST IMPORTANT BUILDINGS EVER CONSTRUCTED OF PORTLAND CEMENT CONCRETE.

General dimensions, 175 x 95 feet in form of inverted T; height, 36 feet, and to apex of dome, 65 feet. The foundation walls, floors, pillars, partitions and dome of cement concrete. The building is practically an immense rock, cut and dressed with architectural ornament, on the exterior, and mined inside in the form of rooms. The concrete is finished in a most satisfactory manner; both smooth and rough surfaces are produced with perfect success. The appearance is so perfect that the difference between natural stone and the concrete is indistinguishable. This building represents a class of construction that is certainly ahead of anything known to the building world as regards its fire-proof qualities, and presents sufficient evidence in every way to convince the architect and builder who may have the opportunity to inspect it, that this method of construction is deserving of its great success. The Court House is connected by a concrete tunnel with the jail, which is also built of Portland Cement.



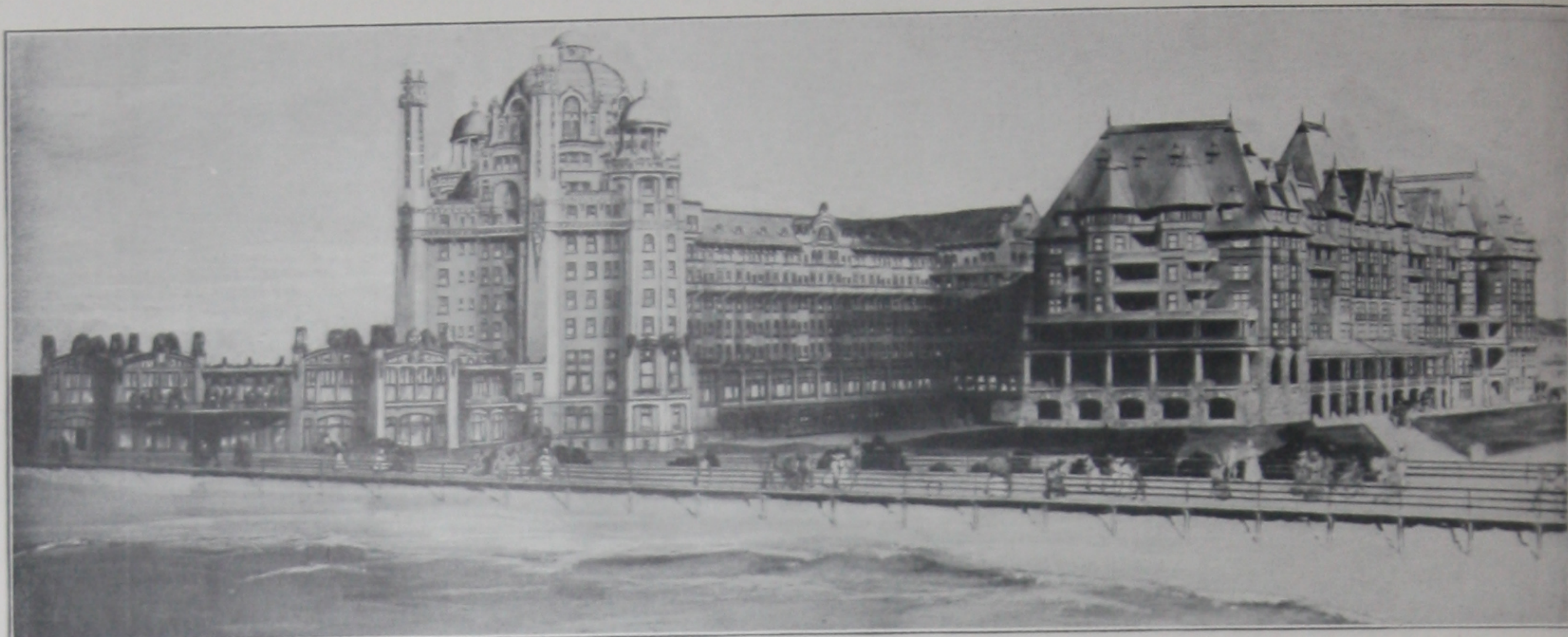
Union Savings Bank and Trust Company. Cincinnati, Ohio.

An interesting example of cement concrete construction. The entire structure, including the front and all ornamentations, of Portland cement concrete. "We produce from Concrete."



An Example of Perfect Cement Construction.

Court Room of Nassau County Court House, shown on opposite page.



General View of Hotel Blenheim, Atlantic City, N. J.

One of the largest examples of reinforced concrete in the United States. 128x326 feet and 8 and 12 stories high. The building is an object of great interest to architects and engineers, owing to certain unusual methods of construction. It is not an exaggeration to say that its construction is another triumph for reinforced concrete. The Blenheim is of the most advanced and permanent type of fire proof construction, known as reinforced concrete. All the structural parts, such as columns, girders, floors, roofs, balconies, and domes are Portland Cement concrete, interlaced with steel rods, there being an entire absence of structural steel, brick or wood. Thus there was procured a perfectly fire proof structure at much less cost than would have been involved in steel construction. The piers supporting the columns under the main dome have 12 piles each. In all there are about 1800 piles, averaging 20 feet in length beneath the dome. The wall piers are connected by reinforced concrete beams 4 feet below the surface of the ground to carry the lower story of the wall. The system of concrete construction used in this building is a modification of the Kahn System, employing hollow cement tile and concrete joist in floors with the addition of a solid slab of concrete put in at the same time and forming a homogenous mass, practically a monolith, from foundation to dome.



The Plaza Hotel, Kenwood and Hennepin Ave., Minneapolis, Minn.

A concrete structure just completed at a cost of \$250,000. The building is six stories high, has eighty apartments, a roof garden will be added later, and is one of the finest hostelrys in the Northwest. W. J. Keith, architect and principal owner. "We produce from Concrete."



Residence of J. R. Ware, Ft. Thomas, Ky.

This house is entirely reinforced concrete including walls, floors, chimneys, porches, etc



Portland Cement Residence.

Built of Normandin hollow concrete building blocks, broken Ashlar style.



National Galleries of History and Art, Washington, D. C.

Under process of construction out of Portland Cement. Will cost when completed \$10,000,000.
Would cost in stone \$40,000,000.

In an article entitled, "An Artist's View of Cement Construction," the writer says, "Nature and science have joined hands in this product, and only await art and the art lover to step in and render the symposium complete when our dream of the Washington of the north shall be realized in the erection of noble monuments or art; columnar edifices whose pediments and walls shall breathe their story in living forms of art by the plastic hands of the artist sculptor and our bridges, parks and driveways be adorned with fairy fountains, statuary, and terraced walks, and all executed in the everlasting adamantine cement."

In Defense of Concrete.

He would be a bold prognosticator who would attempt to define a limit for the future uses of concrete. This has aptly been termed the Age of Cement, and so of concrete. We are walking on it, riding on it, eating our daily bread from grain stored in concrete elevators, taking our drinking water from concrete reservoirs and cisterns, living and doing business in houses constructed of concrete, sanitating our cities with sewers of concrete and last, but not least, enterprising undertakers are offering us the opportunity of taking our final rest in concrete burial cases deposited in concrete tombs, surmounted by concrete monuments, sacred to our evanescent memories.

The qualities of concrete as a fire-resisting material have been so often demonstrated through experiments and tests, and lately exemplified and emphasized in actual practice in the Baltimore fire of February, 1904, that no argument is necessary to establish its eminent fitness as a fire protecting armour in steel construction. With all the ascendancy of concrete as an economic constructive material, it is yet subject to the blighting and retarding influence of the quack, with his avaricious eagerness to get rich, reaching out beyond his depth, committing engineering sacrilege and constructive "hari kari," following the path on which "Fools rush in, where angels fear to tread." Concrete with its amplitude of adaptability and multitude of uses will enter largely into the plans and calculations of the twentieth century engineer and it will inscribe its own history in ineradicable lines, as a monumental evidence of that living aphorism: "The survival of the fittest."



Cincinnati Ball Park Grandstand, Constructed Entirely of Portland Cement.

A striking instance of modern cement construction is the new and elaborate grandstand and clubhouse of the Cincinnati (Ohio) baseball club. The length of the stand is about 300 feet and semicircular in form, and 50 feet wide, with a drop of about 10 feet in this latter distance to allow for the slope of the seats. The boxes in front project as the picture shows, about eight feet beyond supports, and the cornice comes out the same distance. This was done entirely by using the concrete steel being used.

A concrete club house was built underneath the grandstand. Some of the spans in the grandstand proper are 36 feet long. The roof is also made of Portland Cement concrete.



Stadium—Harvard University.

Ransome System Reinforced Portland Cement Concrete Throughout.

Demonstrations of the use of Portland cement concrete in large works and which will be seen by many thousands of persons each year are the great Harvard Stadium, located on the athletic field of Harvard University, Cambridge, Mass., and the new stadium erected at New Haven, Conn., by the Yale University. Some idea of the immense size of the work is given when it is stated that a seating capacity of 40,000 is provided for in the Yale Stadium. The Harvard Stadium is U-shaped, 1,573 feet long and 420 feet wide and will seat 25,000 to 30,000 people. Concrete style of construction is now becoming very popular for Stadiums and Grandstands, one was also completed this year on the athletic field of the Washington University, St. Louis, Mo. Its length is 792 feet and will seat 10,000 people.

Coffins of Concrete.

A new feature in concrete construction is that of the cement coffin. While the outside box of concrete is already quite common, the coffin itself is something of an innovation. However, several designs are now upon the market and are being favorably received. As a rule these caskets have steel ribs but the main part is cement. The material can be molded into any shape desired and the finished caskets have the appearance of the finest cloth or polished wood. In point of looks and finish they will have no superior, while as to strength and stability they will have no equal. Cement caskets are impervious to water, vermin and all manner of things tending to destroy it or its contents.

Mr. James J. Hill, President of the Great Northern Railroad, purchased twelve hundred tons of Belgian Cement for use in lining a tunnel to be built by his Company, east of Seattle, and a fleet of sailers has been chartered to import the Cement.—*Cement and Engineering News, December, 1902.*

Methodist Episcopal Church, Decatur, Ill.

The largest and most beautiful piece of Portland cement construction in the west is probably the new First Methodist Episcopal Church recently located in Decatur, Ill. A fair idea of the grace and elegance of the design and convenience of arrangement may be obtained from the above photograph. The exterior dimensions of this handsome edifice are 108x132 feet. "We produce from Rock Products."

University Course in Concrete.

Syracuse (N. Y.) University have in contemplation a complete course upon cement and concrete construction. At present the engineering department includes lectures on the theory and practice of cement manufacture and work in testing cement. There is in course of erection a building to be devoted exclusively to this branch of instruction.



A Portland Cement Monument.

This monument is 24 feet high, 14 feet wide, 6 feet thick, and contains over 80 tons of Portland Cement concrete. It has 22 medallion heads around the base and 6 full length statues above. The monument is one solid mass without break or joint, cast where it stands entirely from Portland Cement, and required less than three days chiseling and dressing to put it into presentable form. It is the work of the sculptor Warren S. Cushman, of Bellefontaine, Ohio.



Germania.

Entire Construction of Portland Cement.

This statue, with its impressive surroundings, was erected at the World's Fair, Chicago, to show the possibilities of Portland Cement in art. Steps, floors, urns, tablets, pavilion and statue were all cast solid in Portland Cement. To builders, road-makers, pavement-layers, students in cement and even sculptors, this majestic outdoor German exhibit offered lessons both in art and experience, for which the world to-day owes its gratitude.



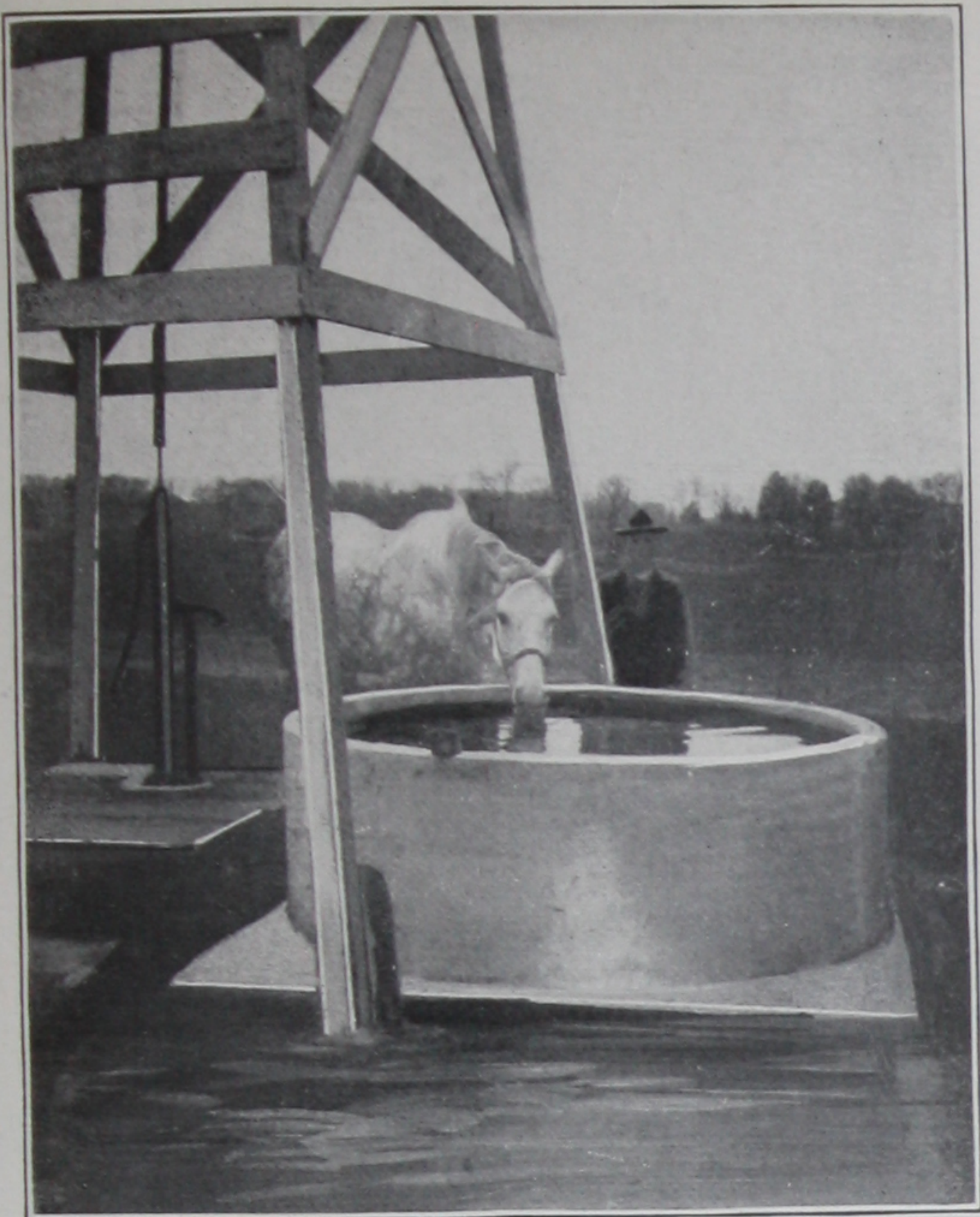
The manufacture of concrete fence posts along with other Portland cement products has become a great industry. One hundred and fifty-nine patents have been issued for cement posts in the United States. The consumption of cement posts in this country today is enormous and a conservative estimate shows the approximate number of concrete posts in use in the United States at the present time to be 3,446,345. Railroad companies, ranch owners, and farmers throughout the country are using cement posts in large quantities and the demand is rapidly increasing. Post timber in almost every state is practically exhausted.

The advantages of cement posts are obvious. Since cement undergoes no deterioration in the earth, the posts will not need to be replaced, as is the case with timber posts, which decay in a few years. Another point in their favor is their fire resisting quality. In many of our western states, miles of fence are destroyed annually by prairie fires. The recent fire at Baltimore has amply demonstrated the reliability of cement in this particular, so it is seen that cement posts may withstand any fire to which they may be exposed. There is no wear on a fence post other than the exposure to the elements. Cement has amply demonstrated its ability to withstand such wear indefinitely, as many structures built by the Romans bear testimony.



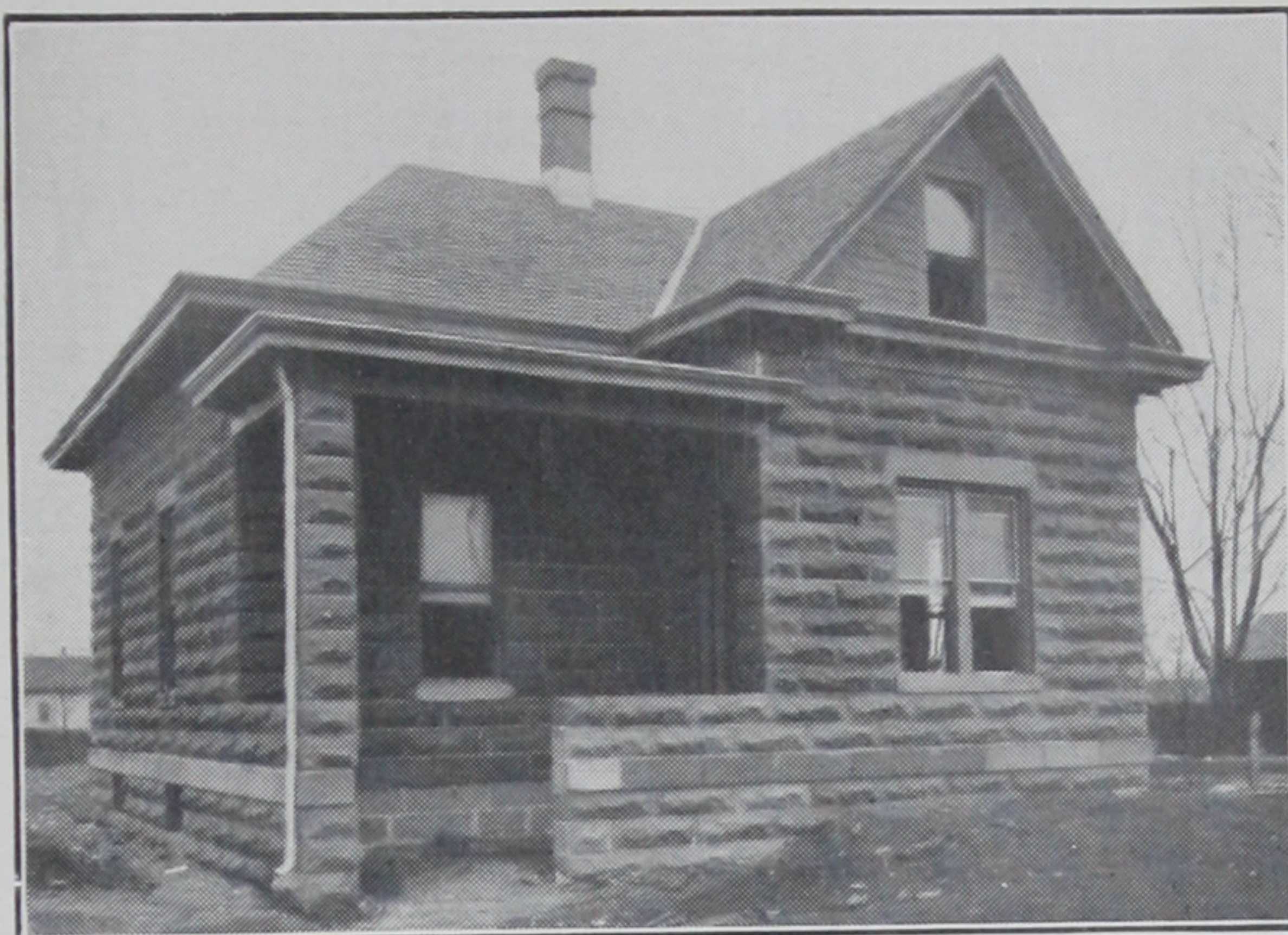
Portland Cement Silo.

On the farm of Thomas Hodgins, London, Ont. Peninsular Cement used exclusively.



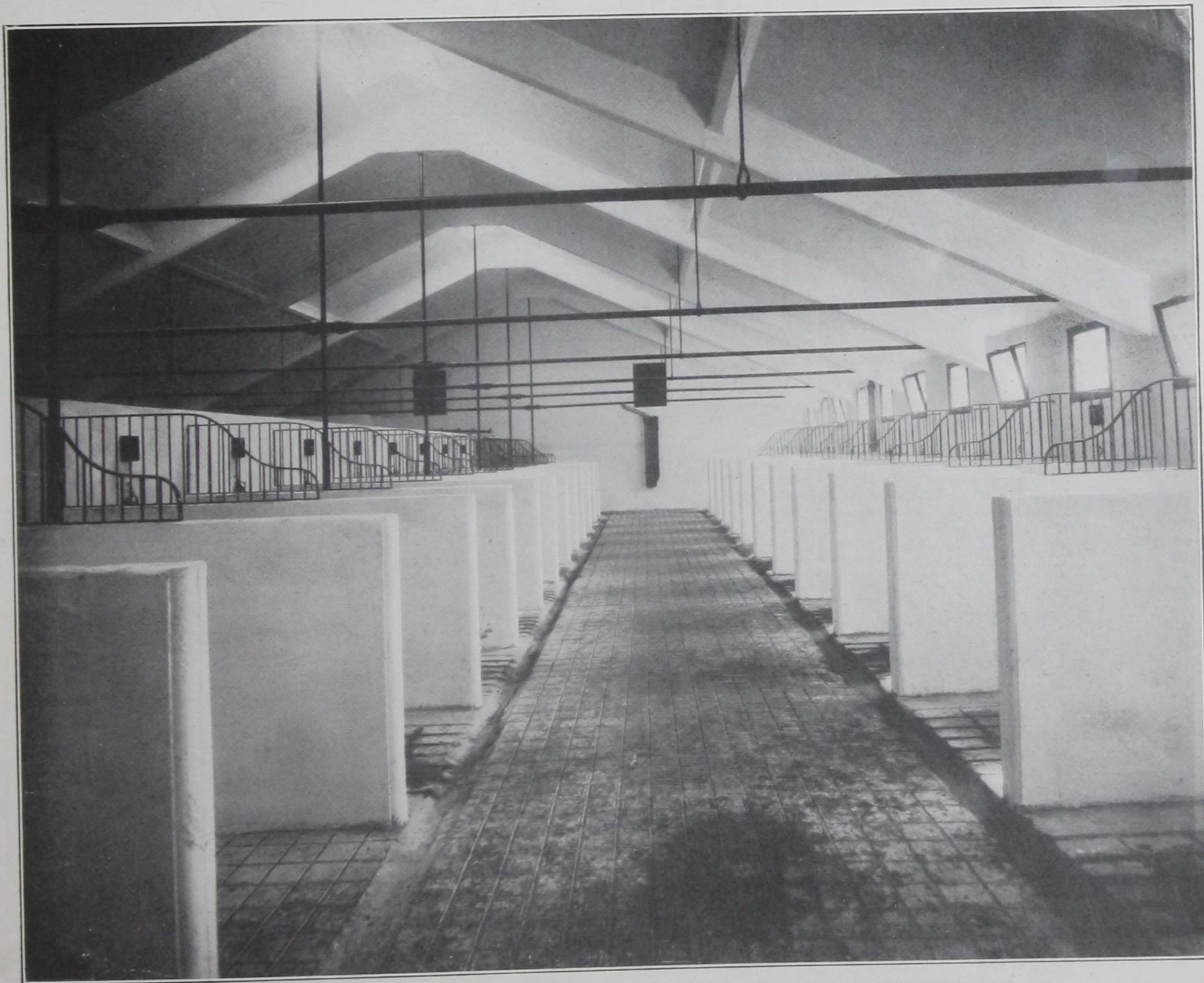
Water Tank constructed entirely of Portland Cement, at Clark Lake, Michigan; capacity, 25 barrels. Thousands of these tanks are now being constructed throughout the country.

PORTLAND CEMENT concrete construction for farmers' use is now a regular topic for discussion at Farmers' Institutes, in state and county meetings. The farm papers are likewise pushing cement construction. There is scarcely an issue that does not contain articles on this subject. Nearly every farmer has almost unlimited capital in his supplies of sand and gravel which could be utilized in building permanent walls, making cement posts, watering troughs, tanks, silos, gutters, reservoirs, floors, walks, etc., etc., not to mention its importance in the construction of farm buildings and residences. In the use of cement the farmer becomes, in the truest sense, a capitalist. He is his own employer, and his hired help can be turned to this work whenever lack of other work affords opportunity. Spring is the best time to begin cement work, because then the air is moist and assists cement work in setting and becoming properly cured.



Concrete Block Farm House.

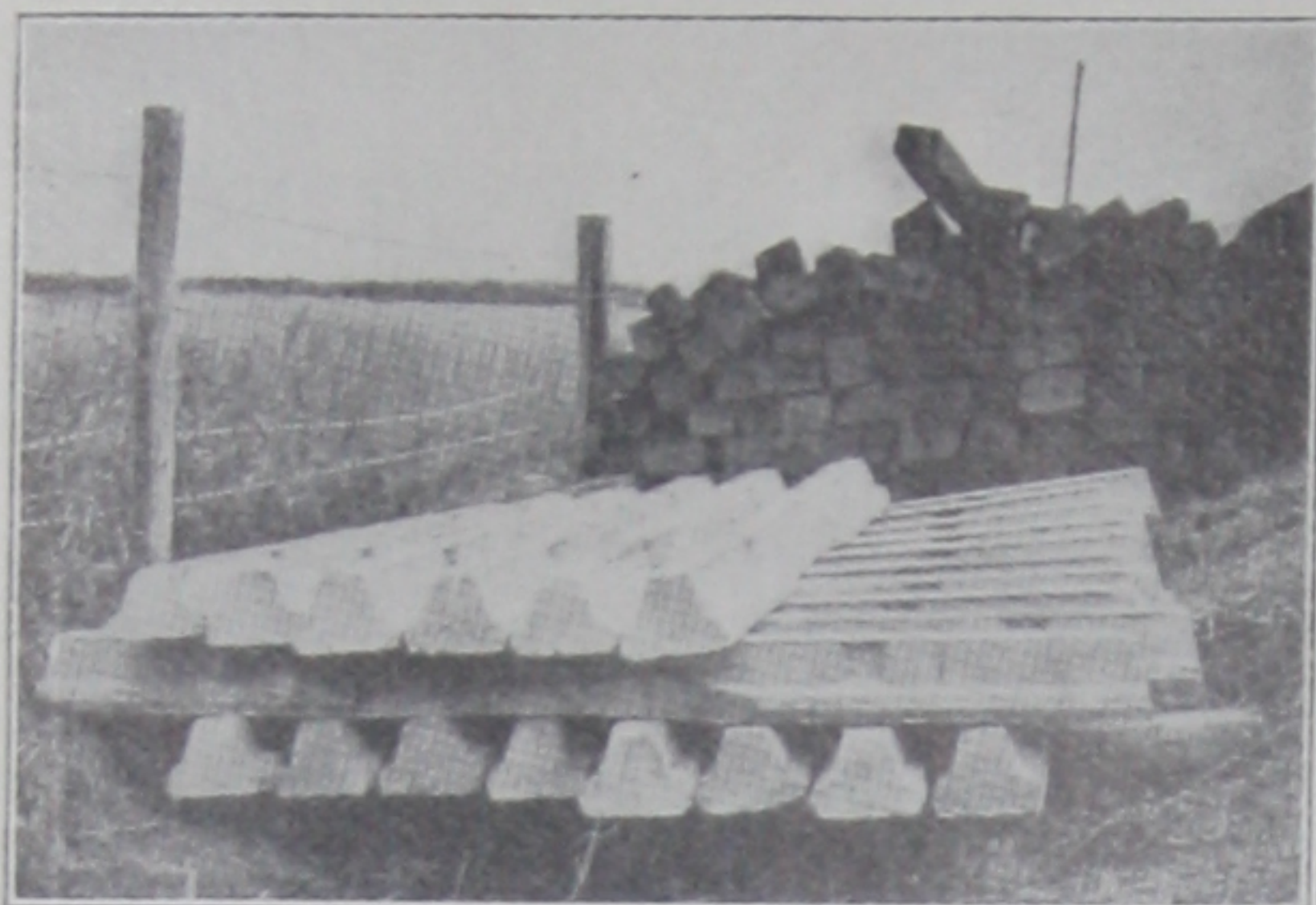
Warm in winter, cool in summer, dry, sanitary, perfectly fire, vermin and frost proof.



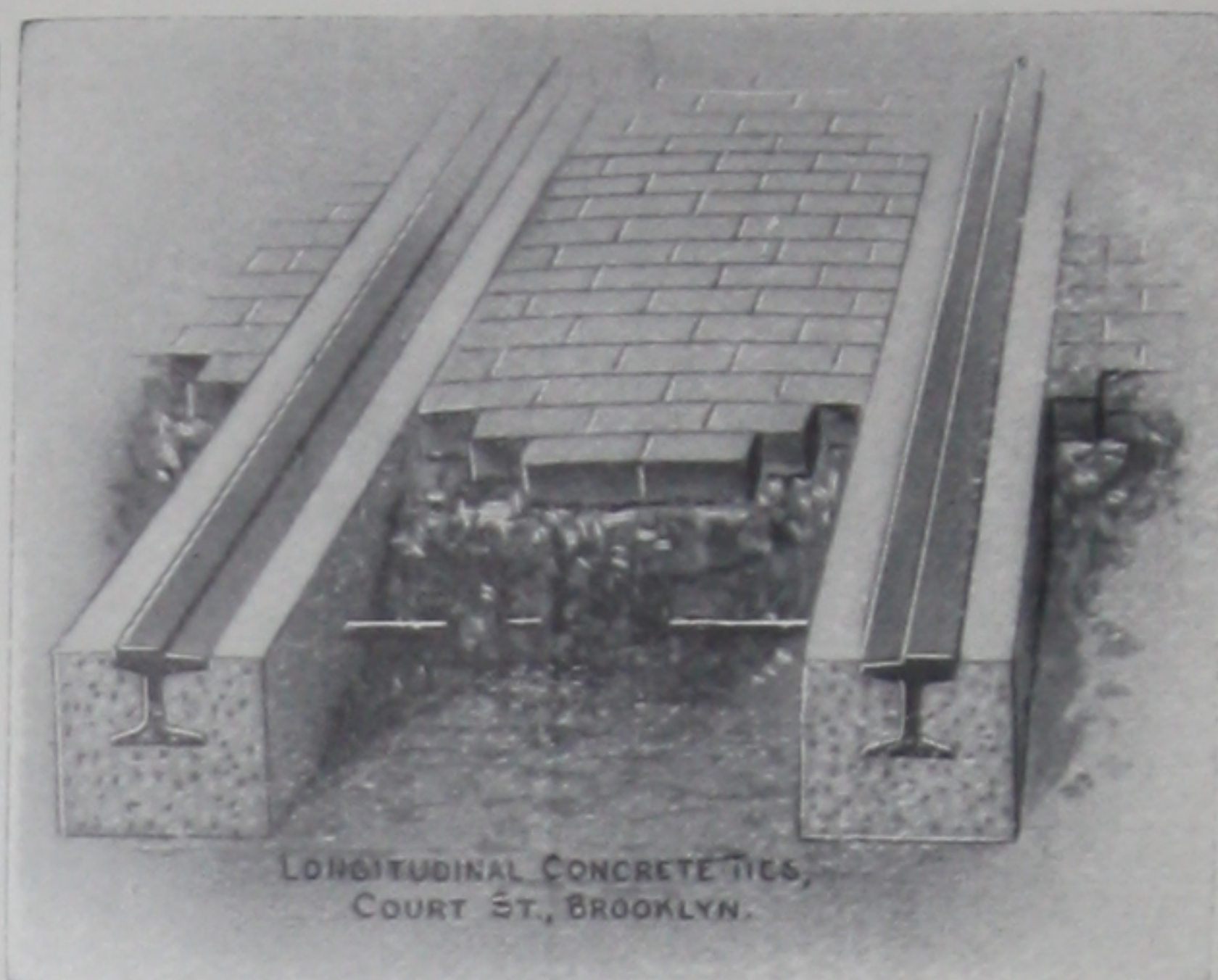
A Recent Example of Concrete Construction.

INTERIOR VIEW OF ROBERT GAIR CO. STABLES, COR. WATER AND MAIN STS., BROOKLYN, N. Y.

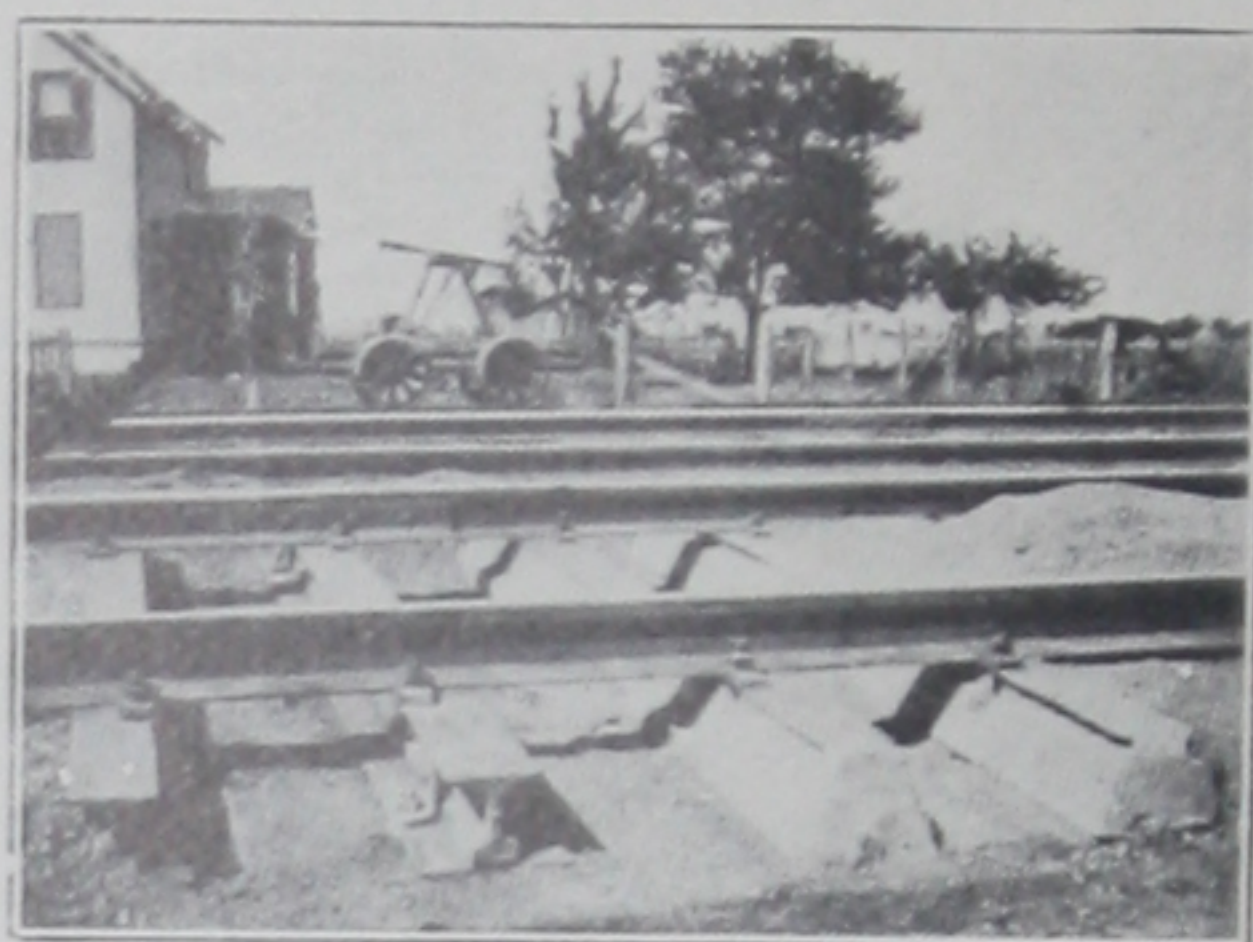
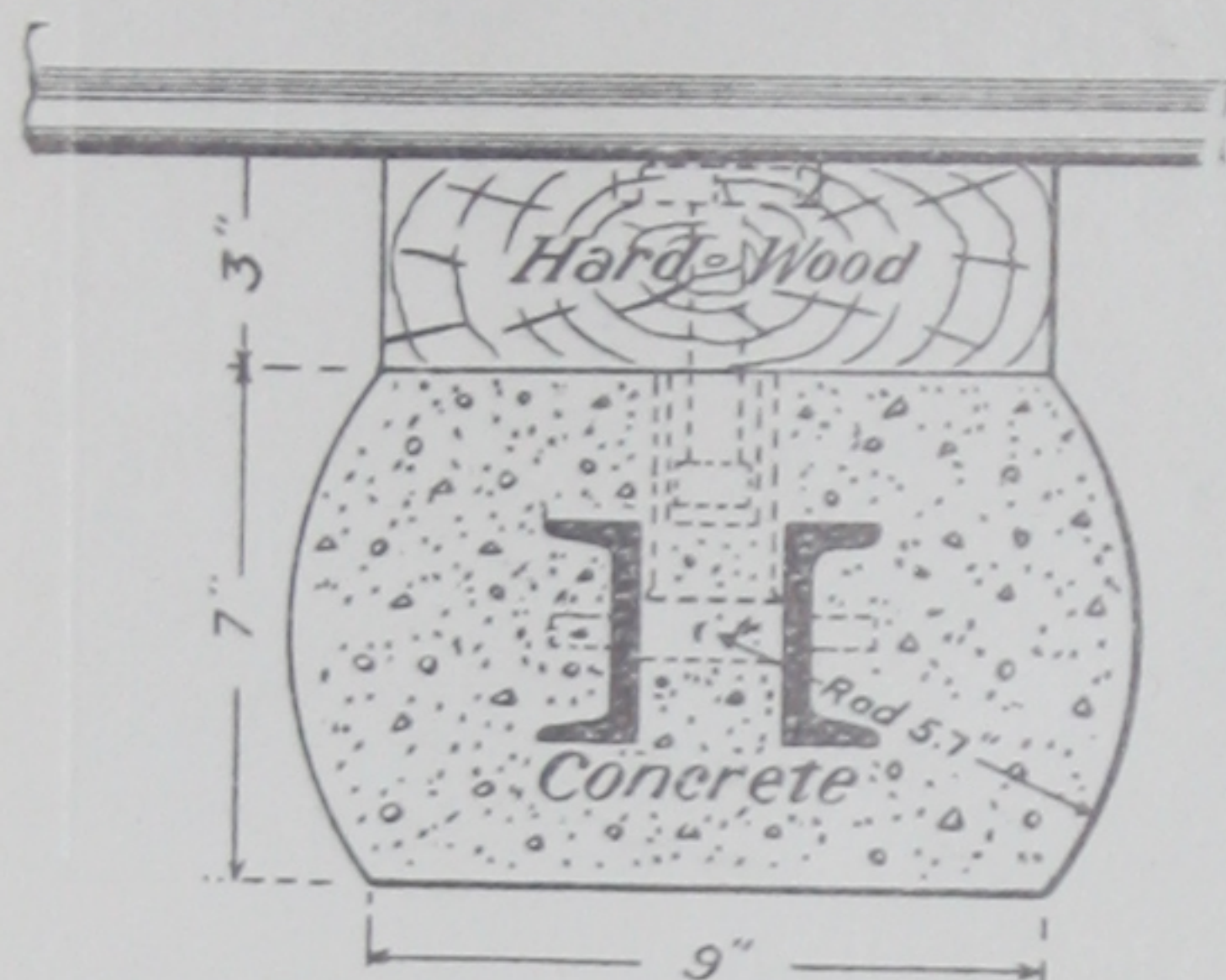
The stable is two story with a loft in front. Wagons are stored in the first floor, which has a cellar span 50x88 feet—no posts or columns have been constructed. On an alley at one side of the building is a runway, used for horses to go to the second floor. This run is also built of concrete. The front portion of the second story is living quarters for the stable man and over this is a loft in which is stored hay and feed. All the stalls, floors and roof are constructed of reinforced concrete and also the partitions dividing the stalls, as illustrated, which is probably the first instance in which concrete has been used for this purpose, but it was the express wish of the owner that the structure be entirely of concrete. These partitions are 8 inches thick. The stable floor for horses is of concrete, grooved to drain to the main gutters at the rear of the stalls. These stalls, being entirely of concrete can be washed out with a hose each day, keeping them perfectly sanitary.



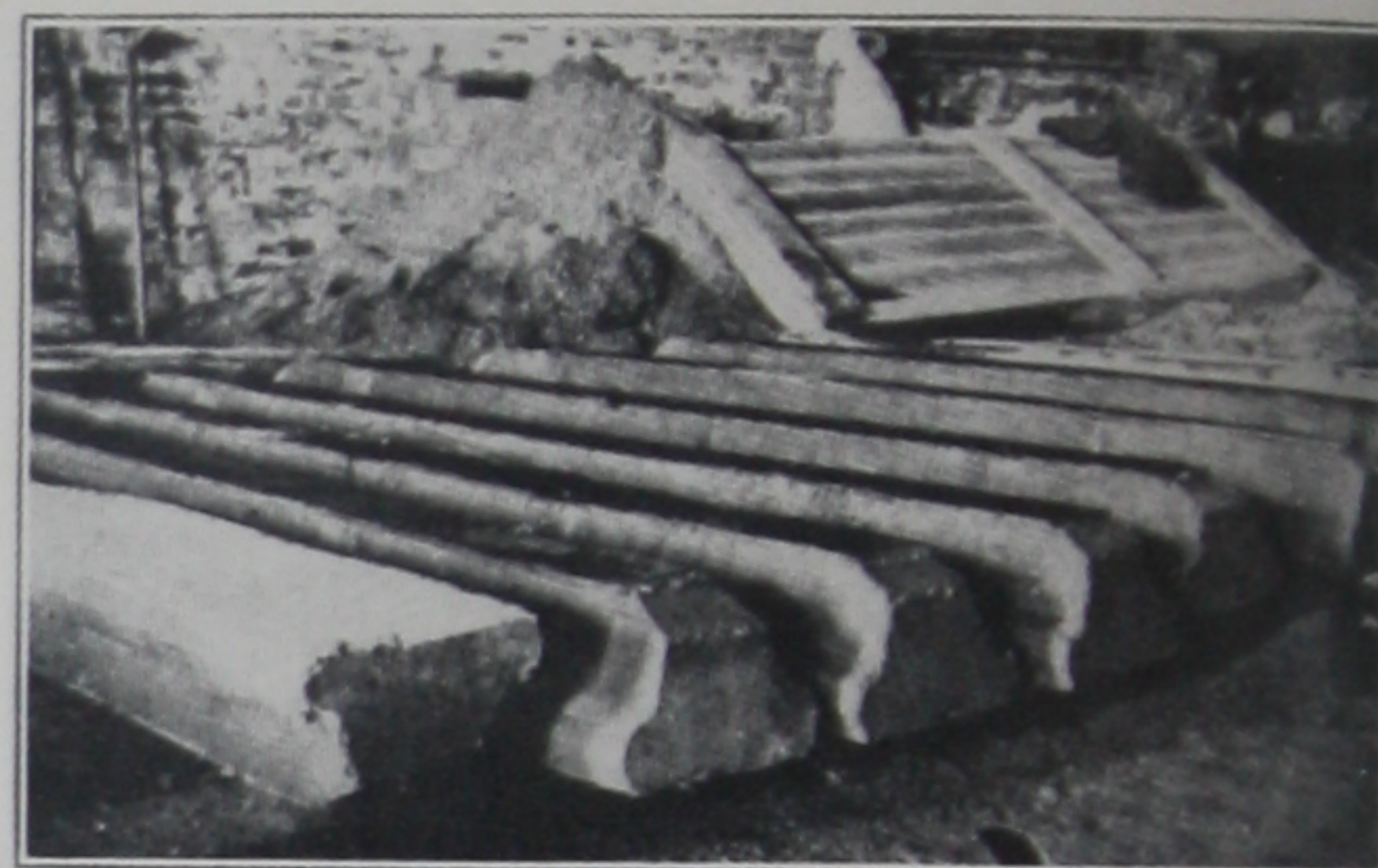
Re-inforced Concrete Ties Lakeside & Marblehead R. R.



Turnout Laid with Re-inforced Concrete Ties



Concrete Ties Re-inforced with Old Worn-out "T" Rails, L. S. & M. S. Ry.



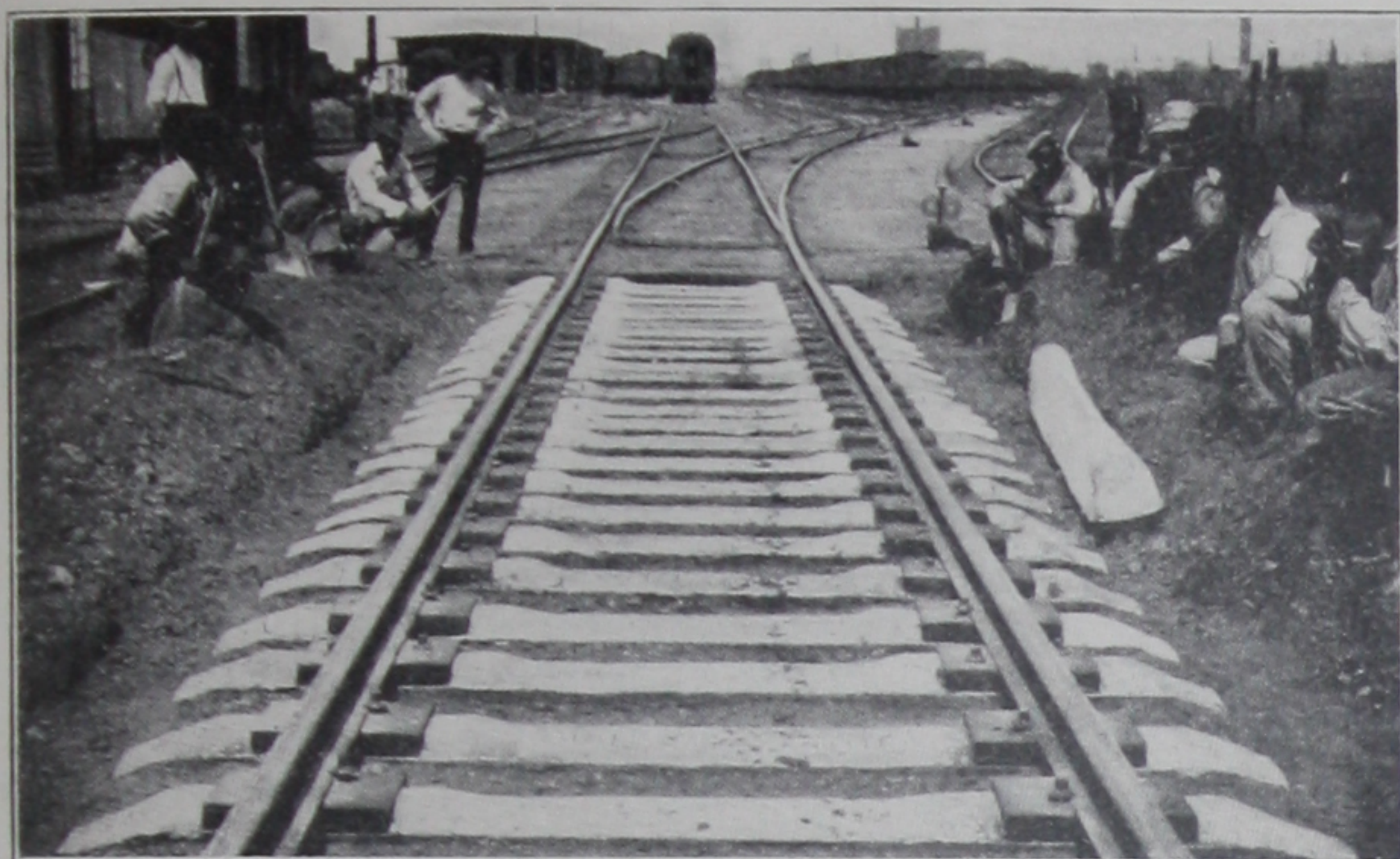
Re-inforced Concrete Ties as Designed for Wabash R. R.

The most important question confronting all railroads today is the roadbed situation. Every important railroad in the country is experimenting with Concrete railroad ties.

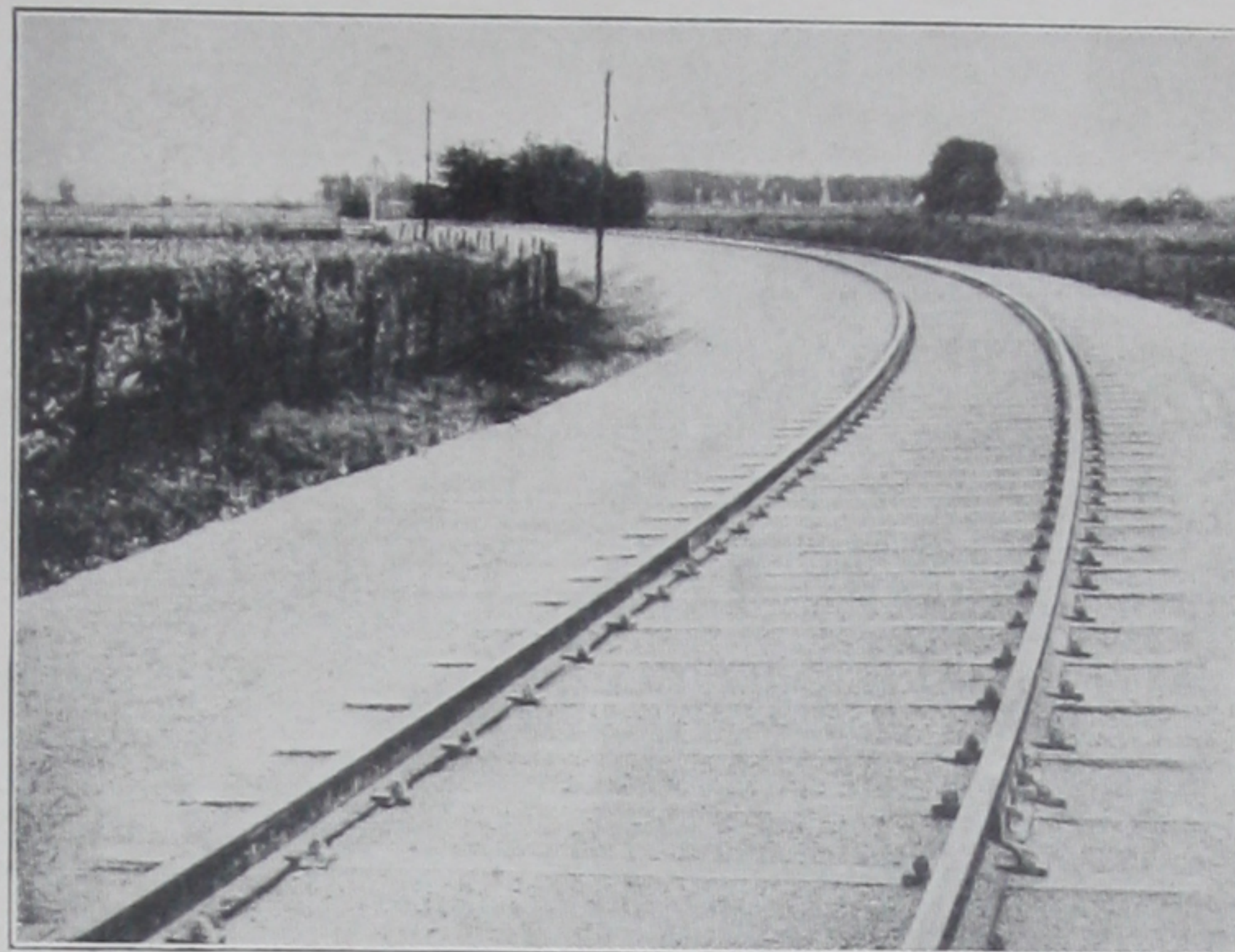


Concrete Ties Pere Marquette Railroad, Placed in November, 1901, and Since Used Successfully by Several Railroads

These ties consist of two blocks of concrete, one under each rail, the blocks measure 3 feet long by 9 inches wide and 7 inches deep and are placed symmetrically under each rail so that the center pressure and center figure of each section on it will coincide, these two blocks of concrete make one tie and are rigidly connected by being molded on the ends of a pair of 3 inch channels weighing 3 lbs. per foot. Hardwood blocks, designed to cushion shocks, distribute pressure, support ties put in this form, from first to last, none have failed, neither has there been a particle of change in the line of gauge or surface of the track.



Testing Concrete Railroad Ties.



Twelve Degree Curve Laid with Re-inforced Concrete Ties



German Concrete Railway Ties.

We illustrate a section of the German state railway near Briesen, Germany, laid with armored Portland Cement concrete ties. The rails are fixed to the ties by an automatic locking device in which the grip between the tie-hooks and rail is increased directly in proportion to the weight of the train or individual car passing over the rail, in other words the grip of the hook plates on the rail automatically adjusts itself to the load. The rail hook plate releases its tight grip on the rail as soon as the load of the train or individual car has passed. The object of this automatic rail gripping device is to give some degree of elasticity to the roadbed; where concrete ties are used, a ridged bond between the rail and concrete tie does not give sufficient elasticity in actual service to be economical on the rolling stock.

This particular section of roadbed at Briesen station has been in actual use since September 28, 1897, on side tracks as well as on the main line under heavy traffic. The ties are in perfect condition to-day.

A cement railroad tie, the invention of C. A. Ford, of Albion, Mich., is now being tested by the Michigan Central Railroad, and it is reported as being very satisfactory in every way.

CONCRETE RAILROAD TIES.

The demand for railway cross ties increases each year. The scarcity of suitable timber has caused the price to rise until it is questionable whether it is economical to use wooden ties when a good reinforced concrete tie can be had. Immense quantities of ties are used annually for the construction of electric railways, and the consumption of ties from this source alone is bound to increase largely and must be added to the number required for steam roads.

There are about 286,262 miles of ordinary steam railroad in the United States, using an average of 3,000 ties to the mile, so that 858,786,000 ties have gone into their construction. Figuring the average life of a tie at 10 years, 10 per cent of the ties now in use must be renewed annually, making a yearly demand for renewals of 90,000,000 ties, not considering new construction, which amounts to about 6,000 miles of track per year, and requires 18,000,000 additional ties. This makes the total annual consumption about 110,000,000 ties. These figures do not include electric railways, elevated railways, subways or private railways used for mining, etc.

The real demands of the day with reference to "permanent way" so-called are that track construction be made really "permanent." It is a serious matter which is rapidly growing in importance and is receiving more and more attention from year to year. Railway managers are certainly justified in worrying over the tie question. The use of reinforced ties has for a long time been seriously considered, not only by inventors, but by the railroad companies themselves. Tests of different forms and designs of concrete railroad ties are continually being carried on by nearly all the old line railroad companies and as, in most instances, they are proving highly efficient there is little doubt but that ultimately ties of this construction will supersede other forms as scientific reinforcement, with properly distributed metal gives a very durable and satisfactory cross tie.

MAINTENANCE.

Concrete railroad ties have many evidences of merit to commend them, none the less of which is the item of maintenance. But little thought is given this subject by the general public and it is scarcely known to them that the tamping of ties, being a part of the work commonly known among maintenance of way men as "surfacing," is the most important and expensive part of maintaining the track in condition for traffic, amounting as it does to something like \$150 per mile per year on the average for heavy traffic roads. Practical tests have found a large saving in this as well as in several items of ordinary track work by the use of the more permanent material. Wherever wooden ties are used the embedment is necessarily impaired in several places in each rail length each year in order to renew decayed ties with sound ones. This disturbance requires tamping of the new ties at least twice in order to obtain equality of supporting conditions, but usually some roughness to track surface results before such equality is obtained. With the concrete tie all such work as adzing ties to return canted rails to normal positions, regauging rails, and shifting of ties to restore normal spacing after derangement by rail creeping is avoided. The definite money value of the expense in maintenance thus saved is tremendous, and this fact alone is stimulating the future use of concrete ties to a great extent.

ROADBED OF CONCRETE.

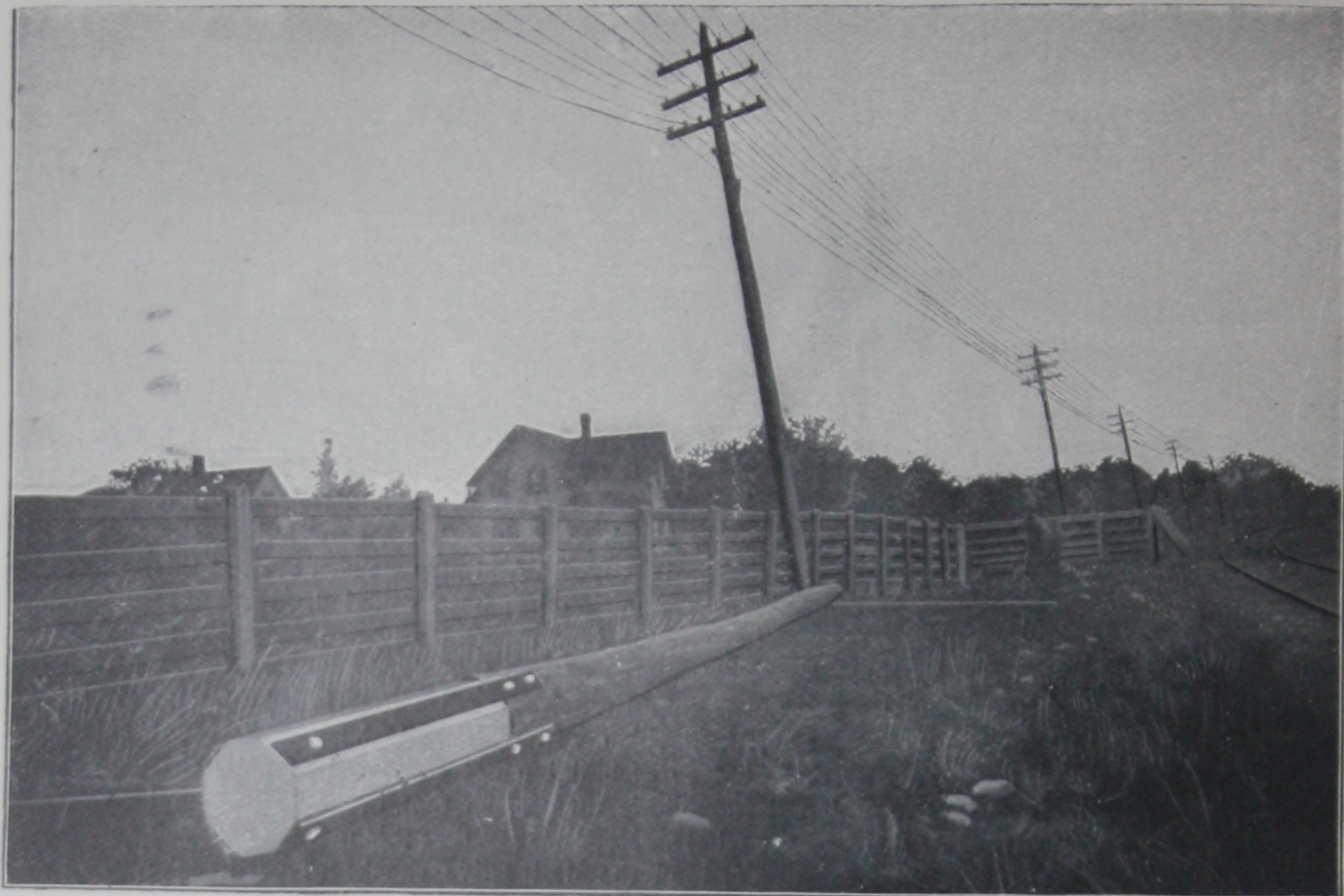
An important experiment in concrete construction was begun October 31st by the Pennsylvania Railroad Company when it started 500 men at work constructing a concrete roadbed on the main line near Williamstown and Rouks, Pa. The matter of concrete roadbed construction on the main line has been under consideration by the engineering department of the Pennsylvania System for some time. The present construction is intended as a test and will be carefully studied by railroad men throughout the country. A solid substructure of concrete will be laid under the four tracks of the main line for ties, rails and ballast. In addition to securing a smoother running road, it is expected that a great saving will be made through the longer life given to the cross ties. If the experimental road proves a success this form of construction will be extended until concrete is one of the most important agencies in railway building.

THE DESTRUCTION AND REBUILDING OF SAN FRANCISCO.

San Francisco, through the combined agencies of earthquake shocks and fire, has been practically wiped out of existence. The disaster stands without a parallel in modern history. Frame, brick and structural steel buildings were wrecked and totally destroyed. The modern skyscrapers, with their steel frame and terra cotta and brick walls, were an easy prey to the shock, which separated the light curtain walls from the now distorted steel skeleton. As appalling as was the earthquake, had it not been for the combustible nature of the majority of buildings, resulting in fire, the property loss would have been a mere fraction of the present. With a great part of her population homeless, and with shattered, fire-swept ruins still smouldering, there is already manifest in San Francisco that spirit which proclaims that a new and greater city will rise from the ashes of the metropolis destroyed. And may we say, even at this early day, that the keynote in the plan of restoration has been sounded. Here was something more fearful than fire, for it destroyed in a moment all known devices to check conflagration and left the town at the mercy of two terribly destructive forces. Looking to the future then, the people of San Francisco realize that in addition to fireproof considerations there must be that which will withstand shock, a form of construction anchored firmly and deep, a type of building not composed of units that can be shaken asunder, but solid and monolithic masses, so that every feature and fragment shall be an integral part of the whole. Need we say that this means concrete?

The class of building that best withstood the destructive shocks of earthquake and fire was monolithic Portland Cement concrete. The reinforced concrete Bell Tower building of the Mills Seminary, which, although it is some eighty feet in height, was not even cracked by the severe shaking to which it was subjected. The Museum Building and Roble Hall, of Stanford University, both built of reinforced concrete, are standing practically intact amid the wide-spread ruin, and in some cases the absolute demolition of the other buildings of the University, all of which were massively constructed with a special view to withstanding earthquake shocks. Two wings, built of brick, had been added to the Museum Building since its completion and these were thrown completely down, while the concrete structure passed through the ordeal satisfactorily. Among the ruins of San Francisco are found steel structures encased in Portland Cement concrete and though the buildings have been blown up by dynamite and the steel work thrown into the street, the concrete still sticks tenaciously to the steel. A four story reinforced concrete building, standing in the center of the earthquake's zone and the burned district of San Francisco, was subjected to the most intense heat created by the conflagration and stands today, very little damaged either by the earthquake preceding the fire, or by the fire itself. In fact, practically all Portland Cement concrete structures within the earthquake's radius escaped unharmed.

In the City of Mexico, where disasters of the kind that destroyed San Francisco had to be taken into account, the handsome Capitol is of steel-concrete construction. In brief, it is a gigantic steel cage, encased in concrete, making a compact, solid mass, which, it is believed, only a frightful upheaval could destroy. We are not alone in citing this example as suggestive in the rebuilding of San Francisco. Engineers have already pointed to it as the only safe type of structures in latitudes subject to earthquakes. Indeed, the whole history of San Francisco abounds in illustrations which emphasize what can merely be hinted at in this instance. Take the history of the shattered frame buildings, and the destruction of her noblest edifices in brick and stone, her perishable wharves and docks, with their teredo-infested piling. It is no wonder that engineers and architects see little hope to encourage effort along former lines. The best that they could devise failed under this supreme test, but in their dilemma they have new examples and resources presented in concrete construction. For withstanding both shock and fire the perfect combination of Portland Cement concrete and steel will be the ideal material. This form of construction upon concrete pile foundation will approach the highest degree of safety. It is possible to build practically, if not absolutely fireproof. More has been done in this direction since the great fires of Toronto, Baltimore and Rochester and the advent of reinforced concrete buildings, now common in nearly all sections of the country, than ever before. This form of fireproofing, which is becoming so common with factories and warehouses, can be profitably extended to smaller stores and residences, with a saving of the larger part of the millions heretofore lost. Along this line it is safe to say that San Francisco is destined to contribute immeasurably to the sum total of our knowledge, just as her great misfortune has made clear where we have erred.



Portland Cement Butt for Telegraph Poles.

By the use of the cement butt old rotten poles are simply cut off where they are decayed and resealed on a permanent cement footing, which restores the old pole to its original height. A line of poles in actual service can be easily rebuilt without disturbing the wires carried overhead or removing the pole from its standing position. It is estimated that a saving of from 35 to 55 per cent. is made in reconstruction by the use of the cement butt on poles carrying overhead wires. New poles can be purchased five feet shorter and the cement butt added to give it the length required, thereby making a saving in the first cost in all future renewals of the line. The cement butt is a conspicuous example of the invasion of Portland Cement specialties into other fields, and gradually displacing in whole or in part the old materials of construction.

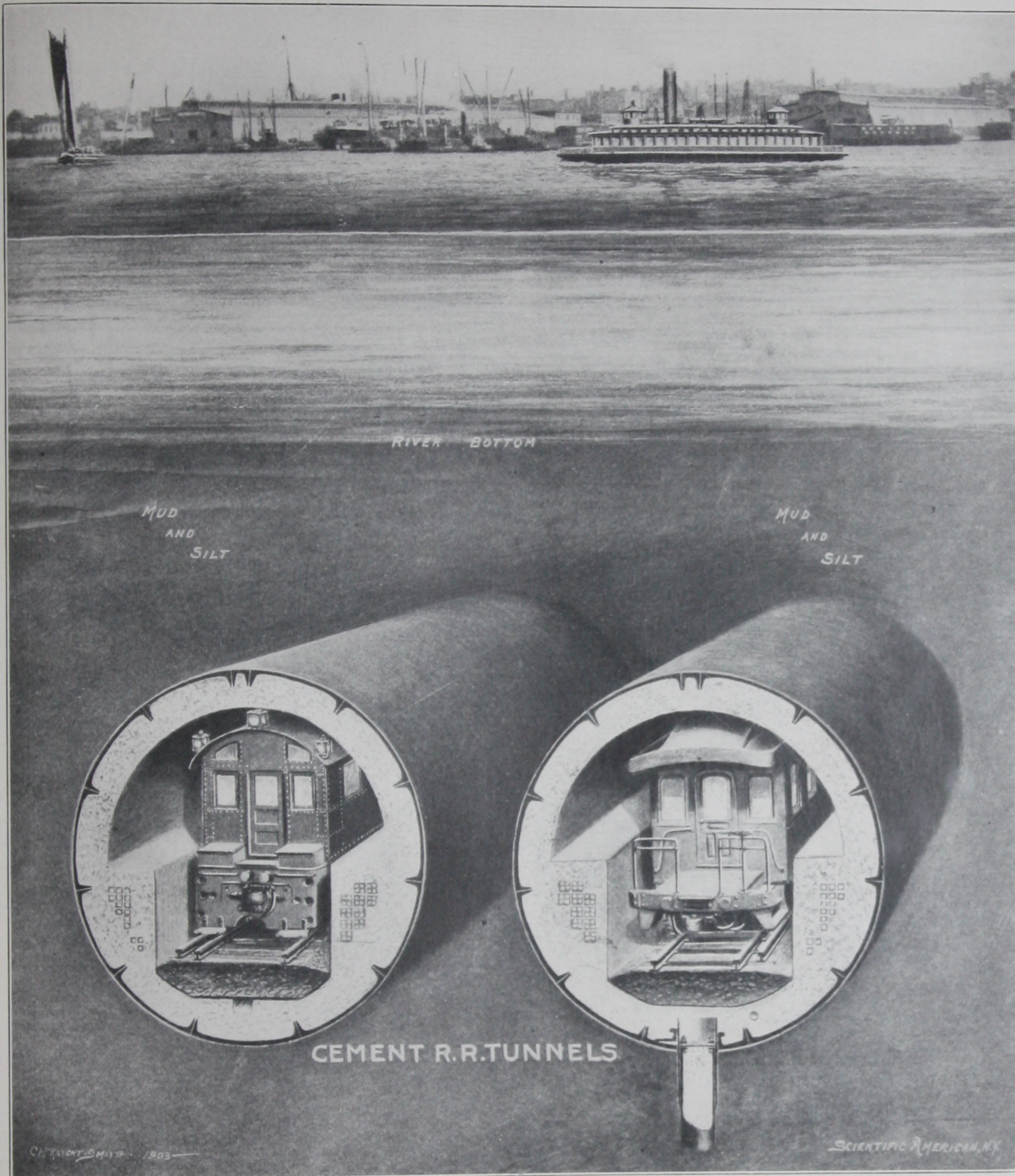
Cement butts have been in use for the last three years, and have proved most satisfactory. Fence posts made entirely of this material are now in general use, and it seems apparent that the day is not far distant when all telegraph, telephone and trolley poles will also be made exclusively of this material.

THIS IS DISTINCTLY A CONSTRUCTIVE ERA.—The Chicago Underground Railway stands as one of the great engineering feats of the present century. Only recently the New York Subway has been opened and attracted almost world wide attention. Similar subways are now being undertaken in many of the large cities, and the dock and harbor improvements of this country are becoming immense. The Panama canal is being built, the Erie canal enlarged and other similar gigantic projects undertaken. In all of these the one material which has entered into the construction more than any other and which has made these possible is Portland cement concrete. Improved methods of handling this material are every day being devised and the cost of construction made a mere fraction of the stone masonry formerly employed. The results are also infinitely better. We are now beginning to build not temporarily, as heretofore, but *for all time*. The great constructive era and the cement concrete age go hand in hand.



Portland Cement Concrete Hotel and Depot Buildings.

The Atchison, Topeka & Santa Fe Railway Co. has erected a magnificent hotel, the Alverado, and depot buildings at Albuquerque, N. M., constructed of Portland Cement concrete in the old Spanish mission style after the plans of C. F. Whittlesey, architect, of Chicago. The hotel is over 300 feet long, built around a court or paristyle and is connected by a 200-foot arcade with the new depot which is shown on the left, while the hotel is shown on the extreme right hand of illustration. The entire collection of buildings represent the most elaborate, artistic and picturesque design in concrete construction heretofore attempted and carried out by a railway corporation.



Sectional View of the Pennsylvania Concrete Railroad Tunnel Beneath the Hudson and East Rivers.

A great engineering project by which the Pennsylvania Railroad is securing a terminal station in Manhattan Island and through connections with the Long Island Railroad system. The new terminal station, covering four city blocks, in addition to being largely constructed of cement, is also built on concrete abutments 40 feet square and 50 feet deep. The amount of concrete used in this building alone is enormous and it will be one of the greatest structures of its kind in existence.

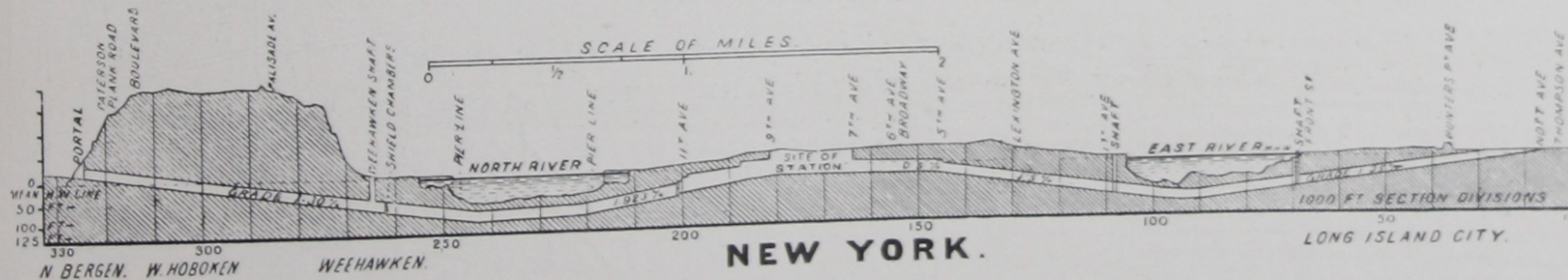


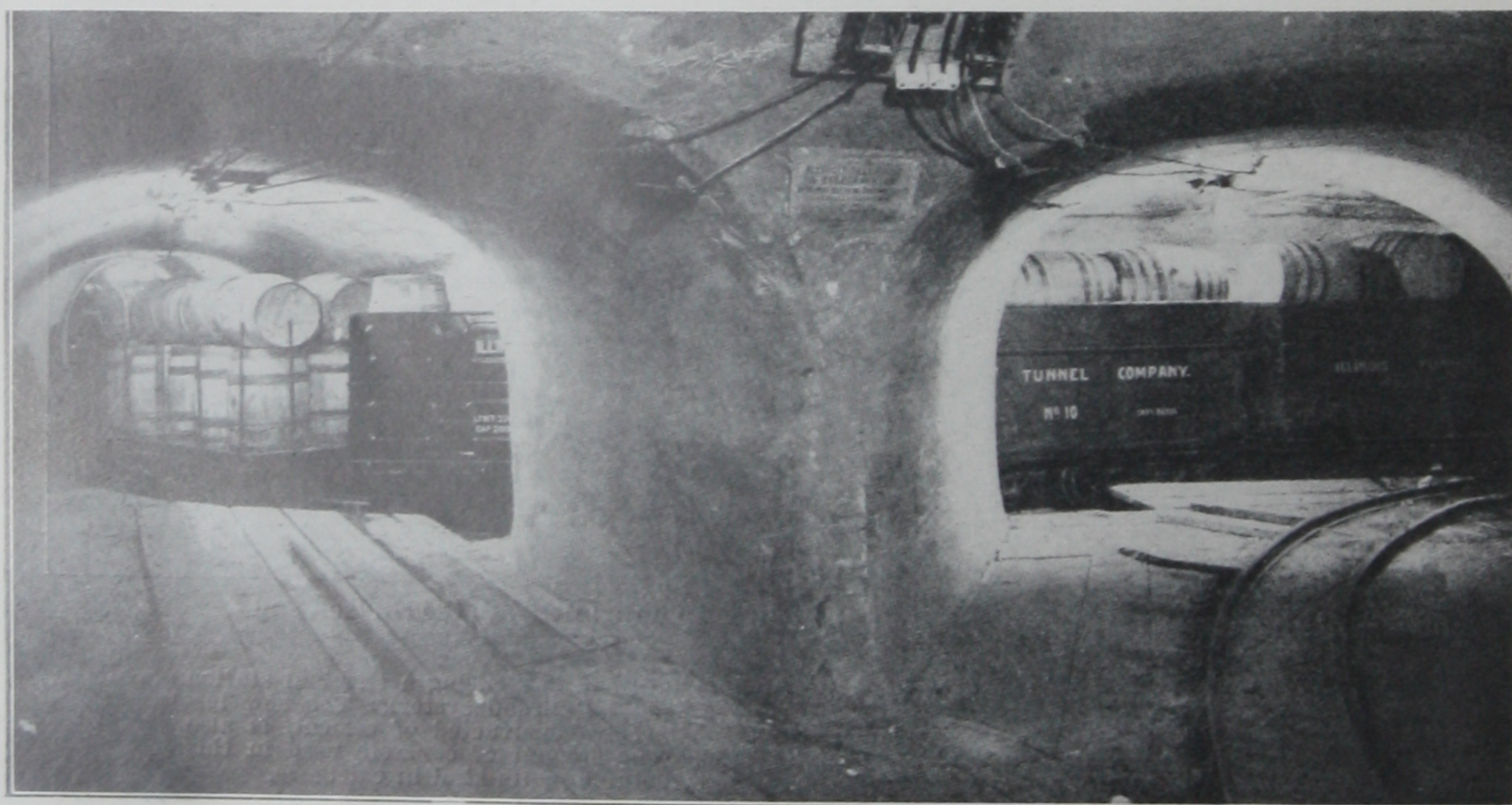
Diagram Showing the Line of the Pennsylvania Concrete Tunnel Under the Hudson and East Rivers.

The total length of the tunnel from New Jersey to Long Island is six and one-half miles. Outside diameter of the tunnel is 23 feet. There are now 16 subaqueous tunnels entering Manhattan Island. Portland cement concrete is the material now used, whether it be bridge or tunnel construction. Millions of barrels of cement are now consumed annually in tunnels and subways.



First Mail Arriving at Postoffice Station Chicago Concrete Underground Railway, March 10, '06.

Chicago today is the greatest mail center on the continent. Eight hundred tons of this concentrated commerce flows through her gates every twenty-four hours. The new underground tunnel railway which began handling the mails on March 10th is one of the greatest improvements ever inaugurated in mail service. The mail is brought on electric cars through this concrete tunnel 40 feet underground and delivered to an endless belt conveyor, which in turn carries the sacks to the postal clerks in the post-office basement. This is the system now employed between the post-office and all the railway stations and this method of handling mails passing through Chicago marks a new regime in the rapid transit of mail matter and would have been considered an impossible undertaking previous to the advent of Portland Cement Concrete Construction.



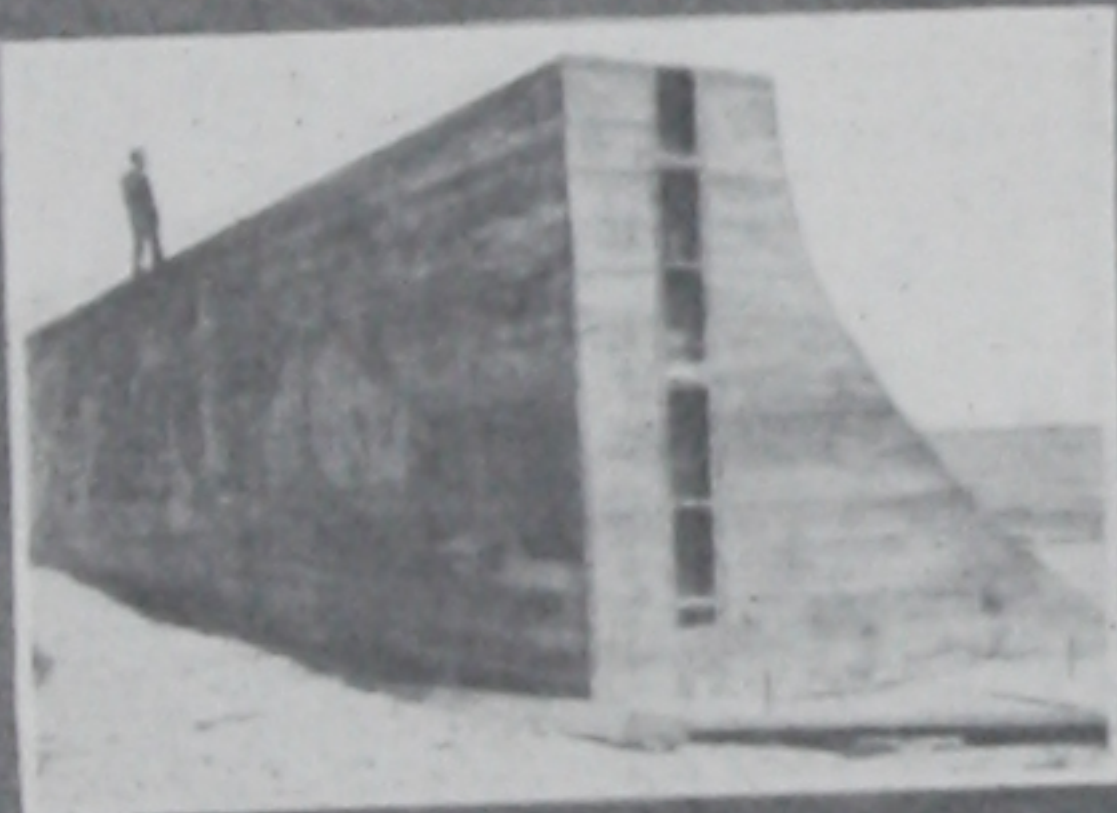
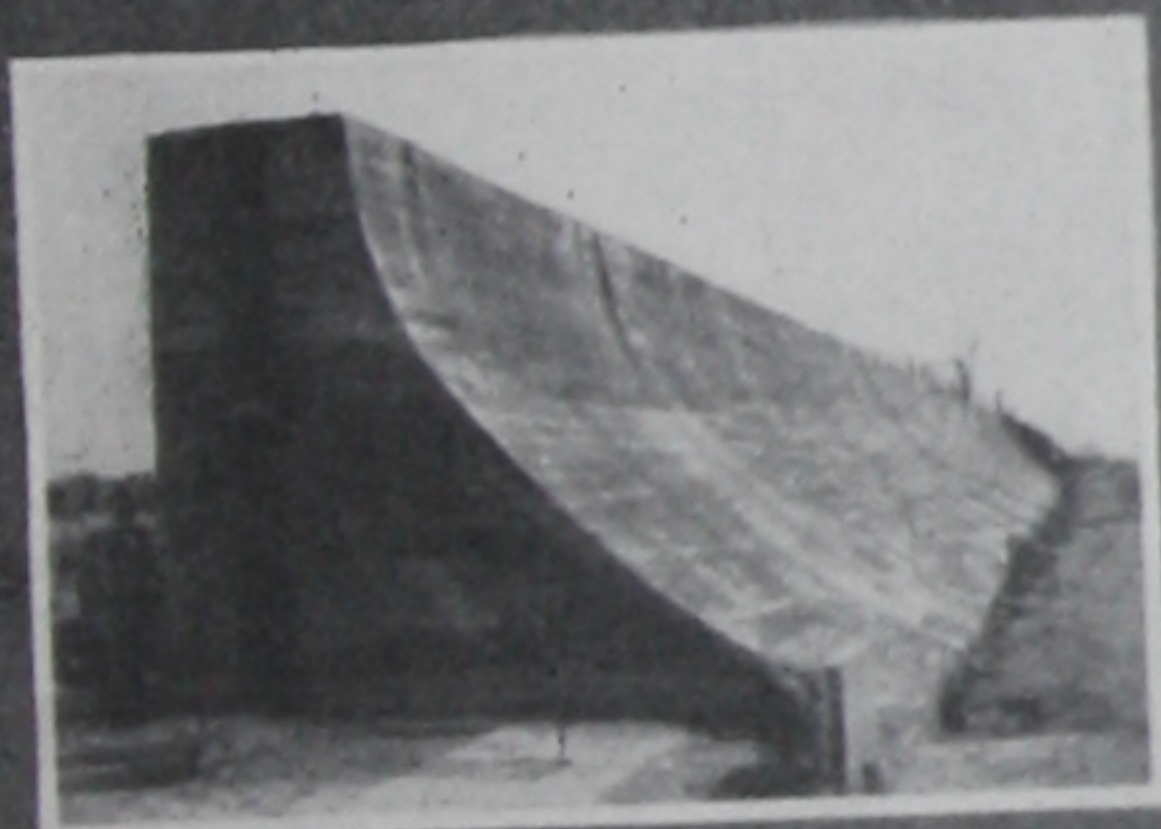
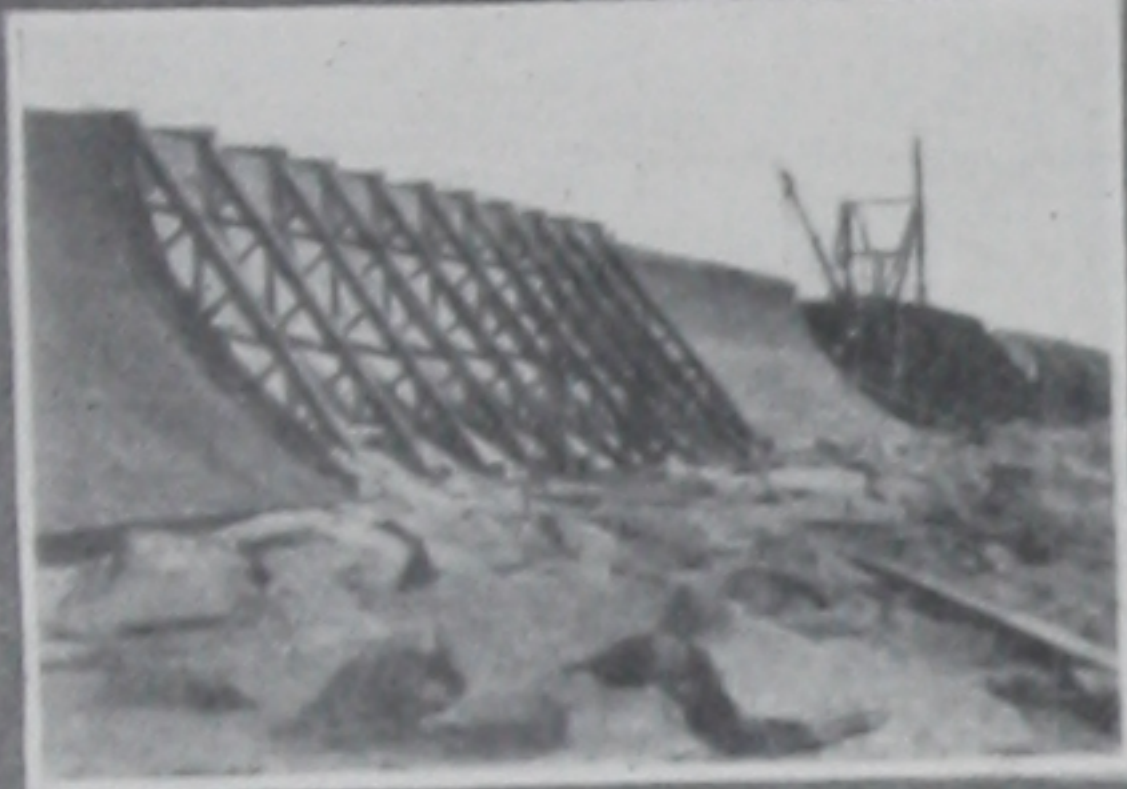
Chicago's Great Concrete Subway Station. "Loaded Freight Train at Street Intersection."

It is the most complete and successful of any tunnel system in the world and is one of the greatest marvels of modern engineering. At the present time there are 43 miles of track in operation. Every street in the down-town district and many outside streets are duplicated 40 feet below the surface by this concrete tunnel system, and eventually all of the principle business streets of the city will be thus connected. There are 24 different trunk line railways within this system, including 6 terminal stations and the tunnels now reach 40 freight houses where they connect by elevator service, endless chain carriers, chutes, etc., and many hundreds of connections are now being made in this manner with big buildings, wholesale establishments and other shipping points. There are 14 tunnels under the River. As a matter of fact, the Sub-way promises to solve one of the labor difficulties which has confronted Chicago in the past. It is predicted that there never can be another teamsters' strike in this part of the city, because the Sub-way has a capacity of two and one-half times the present tonnage of the streets, and it is but a matter of a short time when the bulk of all heavy street traffic will be carried on underground. An interesting test was made by the Chicago & Alton Ry. recently, in which a car-load of coal was unloaded and dumped through a chute into the smaller cars of the Sub-way at Van Buren Street, west of the River. It took one minute and twenty seconds to make the transfer and eighteen minutes later the coal was all deposited in the bins of the First National Bank Building, almost a mile distant. The entire Sub-way is electric lighted, perfectly dry and clean and well ventilated. The walls are made of Portland Cement Concrete, 12 inches thick with a 14-inch floor.



GALVESTON SEA WALL

PHOTOS BY H.H. MORRIS



The Galveston Sea Wall.

A great example of American enterprise for fortifying against recurrence of a flood similar to that of September 8, 1900, when the hurricane and tidal wave so unexpectedly visited Galveston Island, and in which more than six thousand lives were lost and property valued at Twenty Million dollars was destroyed. The accompanying illustrations give a birdseye view of this immense concrete wall during the different stages of its development. The wall is about 4 miles in length, 16 feet wide at the base and 5 feet at the top, and 17 feet high above the average low tide.

As shown by the sectional views, the foundation beneath the wall is also made of cement concrete and it further rests on 4 rows of piling 12 inches in diameter and 44 feet long. Additional protection is furnished by granite riprap extending some 27 feet out into the Gulf. A 100-foot fill, immediately behind the concrete wall, is now used as a speedway and extends along the entire length of the structure. In all, the structure required 18,110 car-loads of material, the major portion of which was Portland cement. It is another case of concrete doing the work, and without which it would have been entirely impossible to accomplish such results in any where near the amount of time or within the contract price.

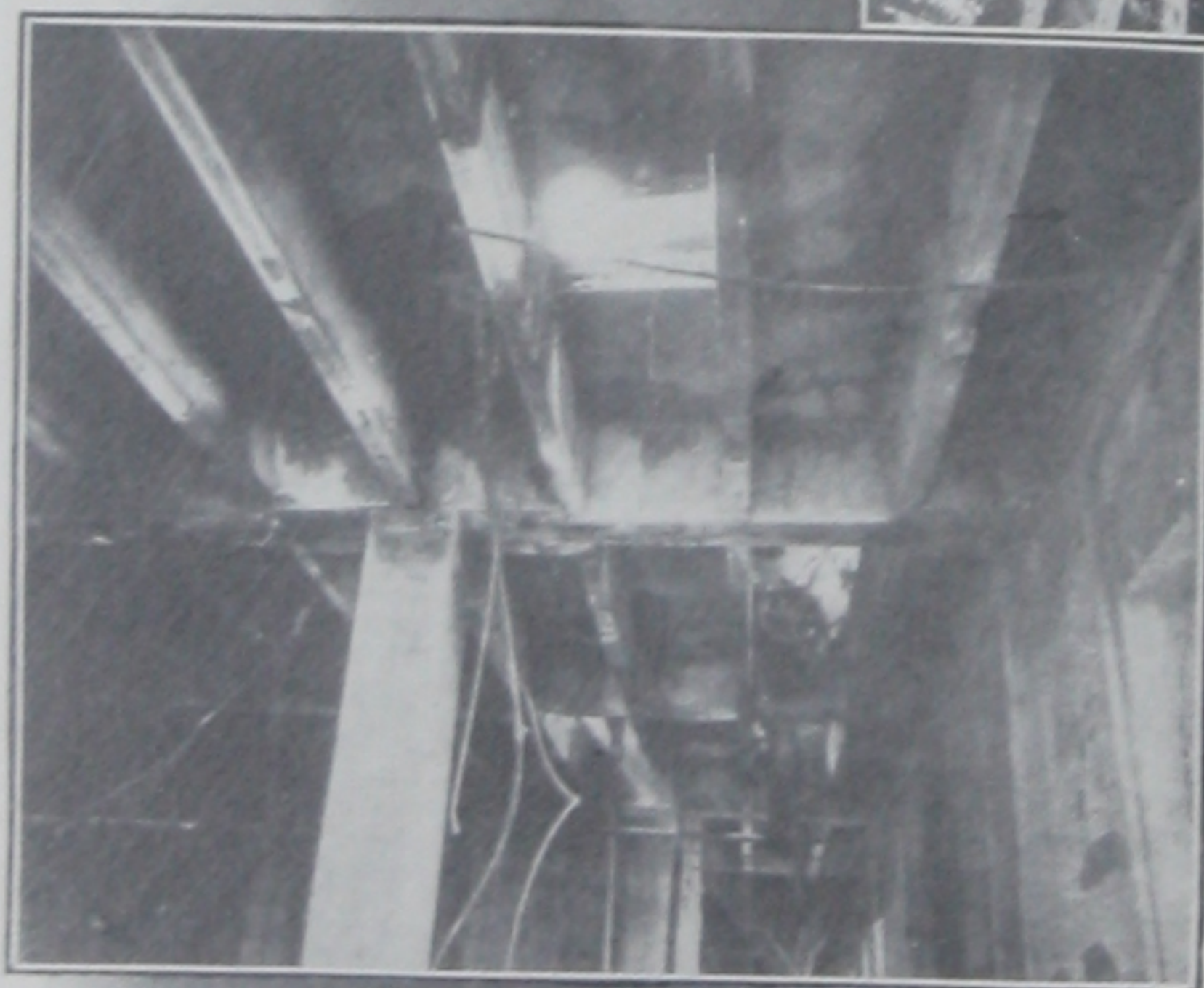
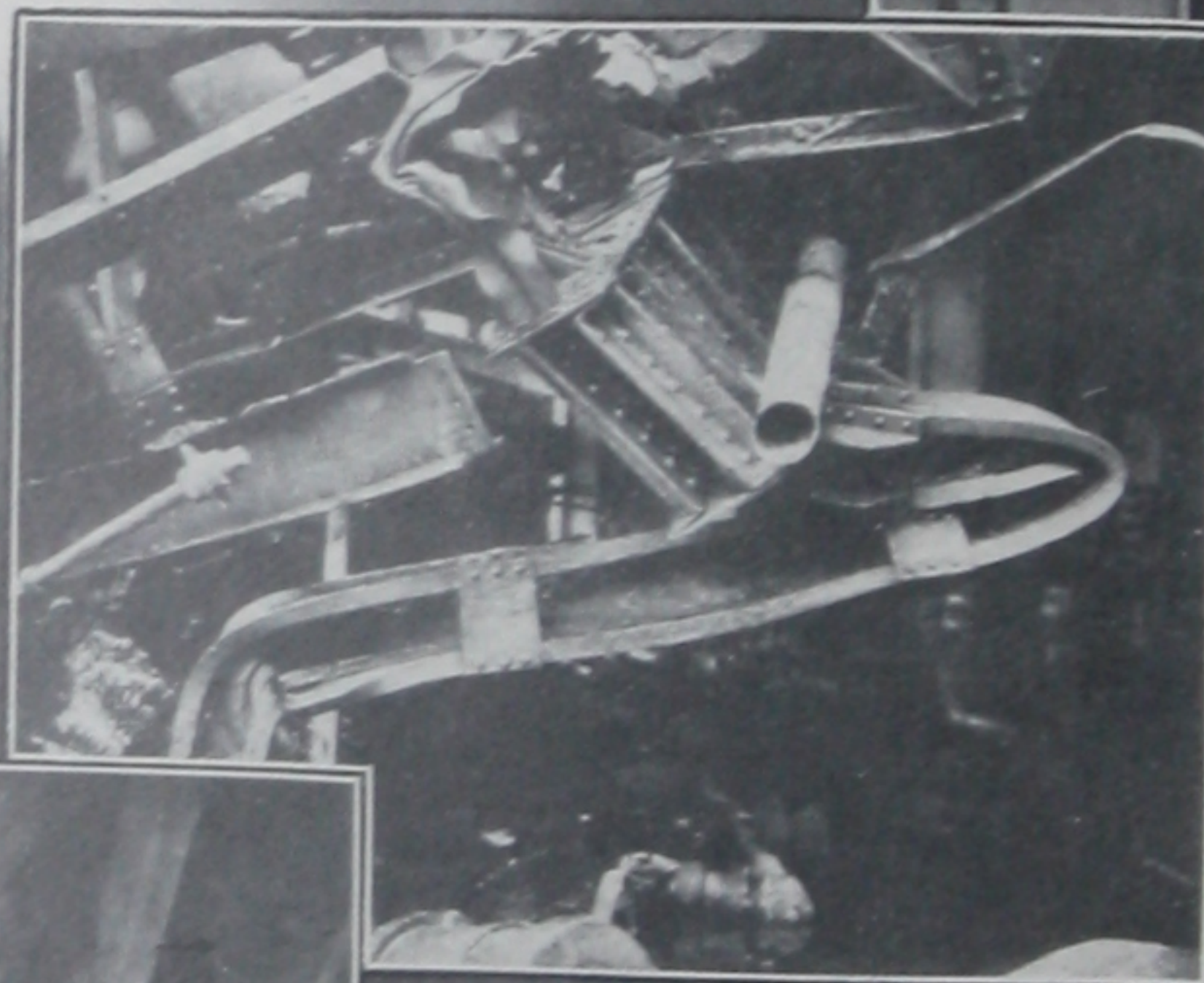
The work of constructing the sea wall was begun Oct. 27th, 1902, and finished July 30th, 1904.

A REMARKABLE DEMONSTRATION OF THE ABILITY OF PORTLAND CEMENT TO SUCCESSFULLY RESIST THE ACTION OF FIRE.

Architects and builders have sounded their praise to concrete as a fireproof material. The ablest scientists have approved of its use. Laboratory tests and fire tests have demonstrated its value. The burning of buildings having cement fireproof floors has shown in a most thorough manner its ability to resist fire, and yet, with all this evidence there has never been as perfect and complete a test brought to the attention of the builders of the world as that contained in the evidence after an intense fire had raged for hours in the factory of the Pacific Coast Borax Company, at Bayonne, N. J., on the night of April 11, 1902:

The building was four stories high and covered an area of 200x250 feet. The roof and partitions were of wood and the building contained a large number of wooden bins, boxes and barrels and other combustibles. The fire originated from the bursting of an oil main, which supplied fuel to the flames. The entire contents of the building were destroyed. The extreme high temperature reached fused the cast iron parts of the machinery, while the walls and floors of the building, of cement concrete construction, were scarcely injured. The repairs to this part of the building can be replaced at less than \$1,000. The 150 foot Portland Cement concrete chimney was not damaged.

CONCRETE PORTION AFTER THE FIRE.—This view shows the condition of the concrete floors, walls and columns of the third story where the fire was most severe and the heat



tained by the metal supports was comparatively light. The tangled mass of metal bent, twisted, broken and destroyed, a complete collapse, wrecking the entire building, demonstrates conclusively that metal becomes, under the action of fire, a destructive agent, aiding and not preventing, the flames in their work of destruction.—*Cement.*



sufficient to fuse copper. The entire concrete construction sustained, without injury, a most severe test, including intense heat and the application of cold water on its heated parts, besides resisting without injury the falling bodies of many tons

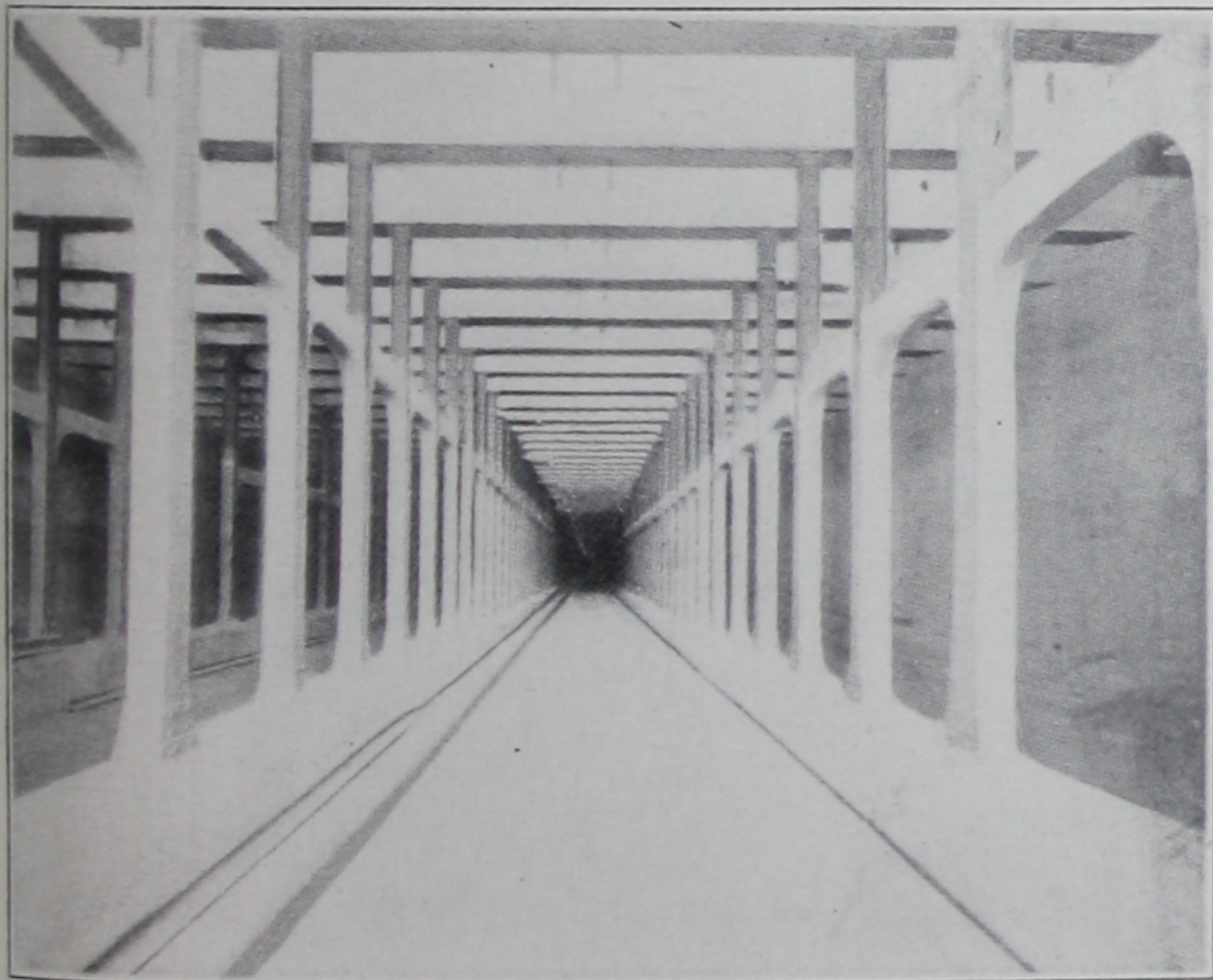
weight. The concrete is in perfect condition. The plaster has chipped off in a number of places, and excepting one place where 18 tons falling 14 feet slightly damaged a floor beam, no repairs will be necessary. The illustrations offer a true means of comparison between the value of metal and concrete as fireproof material.

METAL PORTION AFTER THE FIRE.—This reproduction of a photograph shows the condition of the heavy metal columns and girders in the one-story part of the building where the fire was less intense than in the part of the building constructed of cement, and where the weight sus-



Portland Cement Railway Station. Bismarck, N. D.

(Showing exterior and interior view.)



Interior Philadelphia's Portland Cement Concrete Subway
Before Tracks were Laid.



Reinforced Concrete Factory, Northwestern Knitting Co.,
Minneapolis, Minn.

Showing concrete beams and ceiling and construction
of concrete floor. "We produce from Municipal Engin-
eering."

The total width of the subterranean passage is $48\frac{1}{2}$ feet, its height is 14 feet and $5\frac{1}{2}$ inches, the same as the Boston Subway, which it resembles in many respects; and it is considerably higher than the New York subway. It is a four-track underground avenue, two tracks for express trains and two for surface cars which enter the subway at 13th St. To prevent the usual obnoxious odors common to subways this project was constructed along perfectly sanitary lines and hence the entire roadbed, side walls, roof, etc., were made entirely of Portland cement concrete. The roadbed can be washed down with a hose and drained through sumps, which are placed at frequent intervals. The roof is formed of concrete arches supported on beams five feet apart placed across the subway. The side walls are solid concrete $3\frac{1}{2}$ feet thick reinforced with steel rods and the floor is concrete alone. The rails are laid in a trench left in the concrete, which forms the rest of the roadbed. Additional concrete is then filled into the trench even with the top of the head of the rail. If a rail has to be replaced it is only necessary to remove the concrete in the trench. It is intended that this tunnel shall traverse the entire city of Philadelphia.

CONCRETE FOR PAVING.

Concrete street paving is one of the great possibilities of the near future. Bellefontaine, Ohio, and a number of other cities have tested the idea with very satisfactory results. There is no reason why concrete, if properly laid and surfaced, should not prove superior to any other material for street paving, and the cost would be far less than any other high grade paving. Asphalt has generally been regarded as the ideal paving from sanitary and esthetic points of view, but it is very expensive and soon wears out under heavy traffic, and even for residence districts its tendency to get slippery when wet is a serious disadvantage. Its chief advantages are that it is solid and smooth, but these good points result from concrete foundation and not from the asphalt. Nothing has ever been found that is so economical and satisfactory as the concrete sidewalk. Brick and stone have become obsolete for sidewalk construction, and the smooth white walks of cement are one of the prominent artistic features that we find in American cities. A smooth cement surface would not afford good footing on a street pavement, but it is a simple matter to mold the surface with shallow corrugations or checks that protects the horse and at the same time affords as smooth a road for the wheel as the asphalt, and we then have a solid, durable, economical pavement that is far superior to asphalt or any other material; an ideal paving for the heavy team as well as for the carriage and the automobile. It is easy to keep clean, and no other paving ever designed is so easy to repair. One trouble with brick and granite blocks is that the ground is liable to settle in spots under them, and make depressions which eventually grow into holes unless they are promptly repaired. Concrete, however, forms a solid arched bridge over the entire breadth of the street, so that, if a hole were dug under it five or ten feet across, it would not sink or break under a heavy wagon.



Portland Cement Concrete Pavement.

BELLEFONTAINE, OHIO, AND GRAND RAPIDS, MICH.

The base of the pavement is made of 1 part Portland Cement, 3 parts sand and 5 parts screened gravel. The top is 1 part cement to 2 parts sand. Coarse brush finish was given the surface. Similar pavements are now in general use in many other cities and are giving splendid satisfaction—in many instances have stood years of wear without the expenditure of a dollar for repairs, and are still in perfect condition. Philadelphia, Pa., New Orleans, La., and many other cities are using Portland Cement paving quite extensively.

In various parts of England, Germany and other European countries cement concrete pavements have been in use for years.



In this Peavey construction during course and also the completion. The structure is in cement concrete and what after Euro- that have given un- cess for years. consists of a bat- concrete grain ele-



cut is shown the crete storage bins of construction entire outfit after entire tank Portland ce- planned some- pean models qualified suc- This outfit tery of 30

vator tanks, each over 100 feet in height and more than one-third as much in diameter, with a total capacity of 3,000,000 bushels of grain. On Saturday evening, Feb. 17th, 1906, the large wooden structure shown at the right of this terminal system, containing nearly a million bushels of grain, was entirely destroyed by fire, and the fire-resisting qualities of the concrete bins adjacent were thoroughly tested. The concrete annex containing over 2,500,000 bushels of mixed grain was exposed for hours, at a distance of but 35 feet, to the intense heat of the burning structure and grain, estimated by engineers to be at least 1,800 degrees Fahrenheit, and passed through this conflagration without showing the slightest injury either to the concrete tanks or to the grain stored therein. Notwithstanding the intense heat from the millions of feet of dry lumber in the wooden structure and the 938,000 bushels of grain consumed, which was sufficient to fuse the structural steel and "t" rails between the two buildings, preventing the approach of the firemen within several hundred feet, the 8 to 12 inches of cement concrete, forming the walls of the nearest line of tanks, gave ample protection to the grain stored therein and an examination showed the concrete structure intact and the grain uninjured, clean and even cool to the touch. The total loss of the burned elevator was \$985,000 and the value of the grain which was protected and saved intact by the concrete annex had a market value of \$2,225,000. Mr. A. L. Searle, manager of the Peavey Elevator Co., is enthusiastic over the way the concrete bins stood the heat. He says, "The experience we have just had demonstrates to my satisfaction that the cement concrete storage elevators are the best of all fire proof houses."



The beautiful Club House of the Detroit Boat Club, Belle Isle, is of Portland Cement concrete construction throughout.



Creosoted Wooden Piles. Showing the Effect of the Teredo and Limnoria.
From a photograph taken at San Francisco a few days before the earthquake.

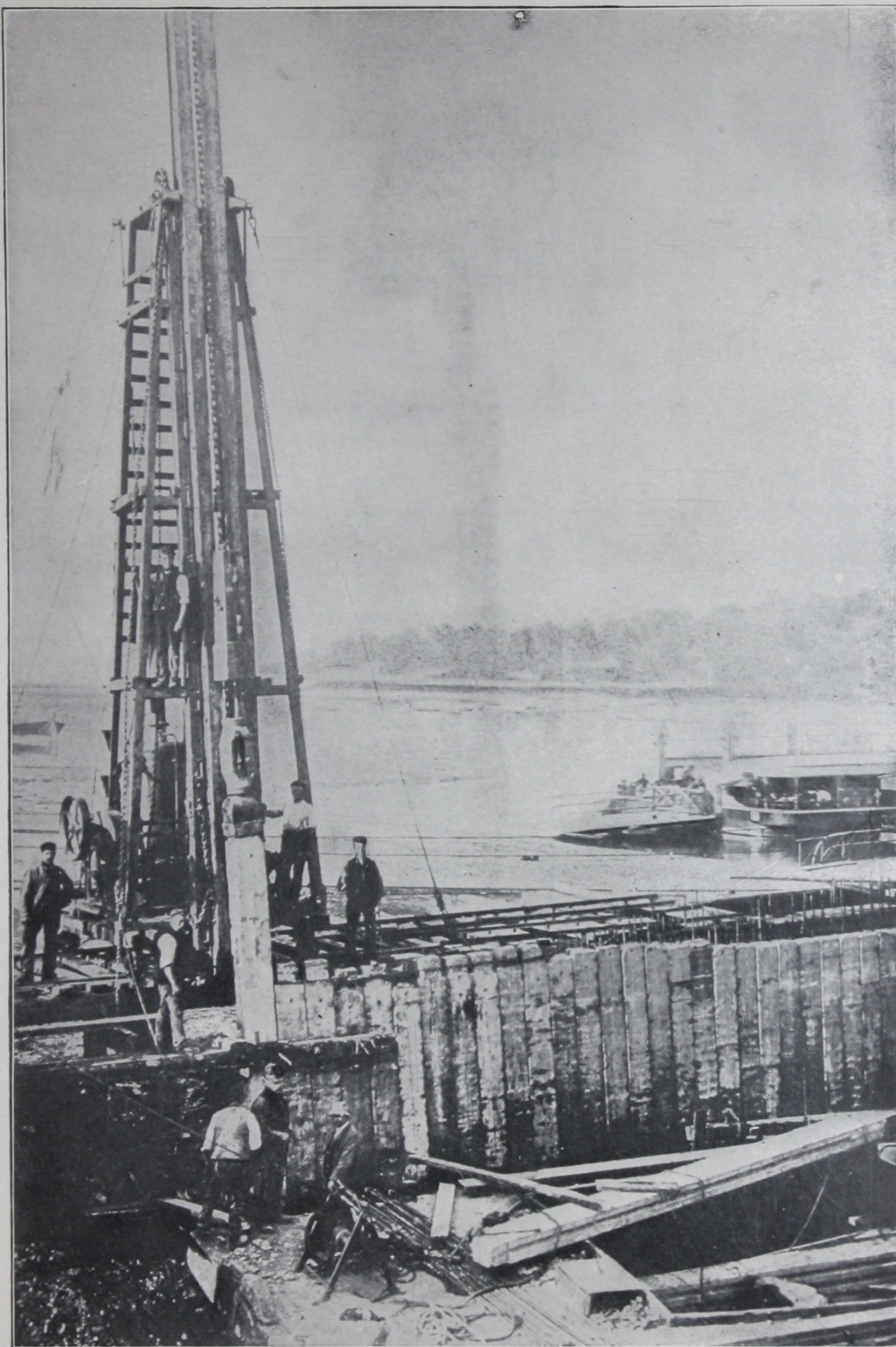
CONCRETE ON THE PACIFIC COAST.

Some of the lessons that the recent disaster has taught the building world, and the plans for the foundation work that will support the rebuilt cities.

The accompanying pictures are of timely interest in that they were taken in San Francisco only a few days before the recent earthquake disaster. They show the effect of the teredo and limnoria on wooden piles exposed to the salt water on the western coast and offer still another conclusive argument for the use of reinforced concrete for foundation work in the rebuilding of the destroyed cities. The upper picture shows a creosoted wooden pile in San Francisco almost entirely destroyed by the teredo and limnoria. In the vicinity of Puget Sound, Mr. Stewart, Assistant Chief Engineer of the Great Northern Railway, states that a stick of timber, rough sawed, will last about eight months; a peeled pile will last a year; a pile with the bark on will last a year and a half and a creosoted pile will last upwards of fifteen months. These piles, as well as the wharves and docks and other water front property, are subject to total destruction by teredo and other marine creatures which devour piling. Referring to the recent disaster, Mr. Frank B. Gilbreth, the New York contractor who has many large structural enterprises under way on the western coast, states: "While it is practically impossible to put up any structure which is able to withstand an earthquake shock of great intensity and varying motion, it is possible to erect buildings capable of weathering a shock such as the recent one in San Francisco. The great devastation resulted more from the flame than the earthquake itself, and this fact emphasizes the importance of using reinforced concrete for fireproof structures. It is safe to say that if the business section of the city had been constructed of reinforced concrete, the fire resulting from the upheaval would never have gained headway." The Columbia Improvement Company, of Seattle, for which Mr. Gilbreth is building a \$500,000 plant, has already taken warning from the San Francisco cataclysm, and in building a half-million dollar power house has ordered a monolithic concrete construction to insure the maximum stability.



Wooden Piles and the Hull of a Wooden Vessel, Showing the Destruction Wrought by the Teredo and Limnoria.
From a photograph taken April 17, 1906.



This illustration shows armored cement concrete piles being driven for wharf purposes at Southampton, England. These piles are jointed and constitute a real, substantial wall of the most approved construction. Numerous applications of these piles have been made for the foundations as well as for wharf walls. They are indestructible as well amongst the atmospheric agents as by the creatures (teredos, etc.), which live in the warm seas. In Holland all the houses have this foundation on piles of 65 to 70 feet. Very high buildings in that country, buildings of an absolute solidity, are constructed because the solid ground can be reached by means of these rigid foundations—armored cement concrete piles.

In the new docks of the Holland-American Line, at Rotterdam, more than 400 piles in armored cement concrete were driven to a depth of 68 feet. Each pile weighed 8,700 pounds.

For the foundations of the bridge of Tangon (France), piles were employed 92 feet long, driven down in three sections, and it is a very fine example of the use of cement concrete piles.

PORTLAND CEMENT CONSUMPTION.

THE unusual large demand for Portland Cement during the present season, together with the constantly increasing output, has evoked numerous inquiries of what becomes of the cement produced, and in what class of constructions the greatest amount is consumed. Fully 60 per cent. of the cement output is consumed in municipal corporations, large and small, in public and private constructions, such as sidewalks, foundations for street paving, combined curb and gutter, basement floors, telephone conduits, bridges, tunnels and subways. Prominent examples are New York and Boston subways and the Chicago telephone tunnel. The latter is a modest enterprise as compared with the New York subway, which will consume several million barrels of cement, while the Chicago telephone tunnel will require at the rate of 100,000 barrels per annum.

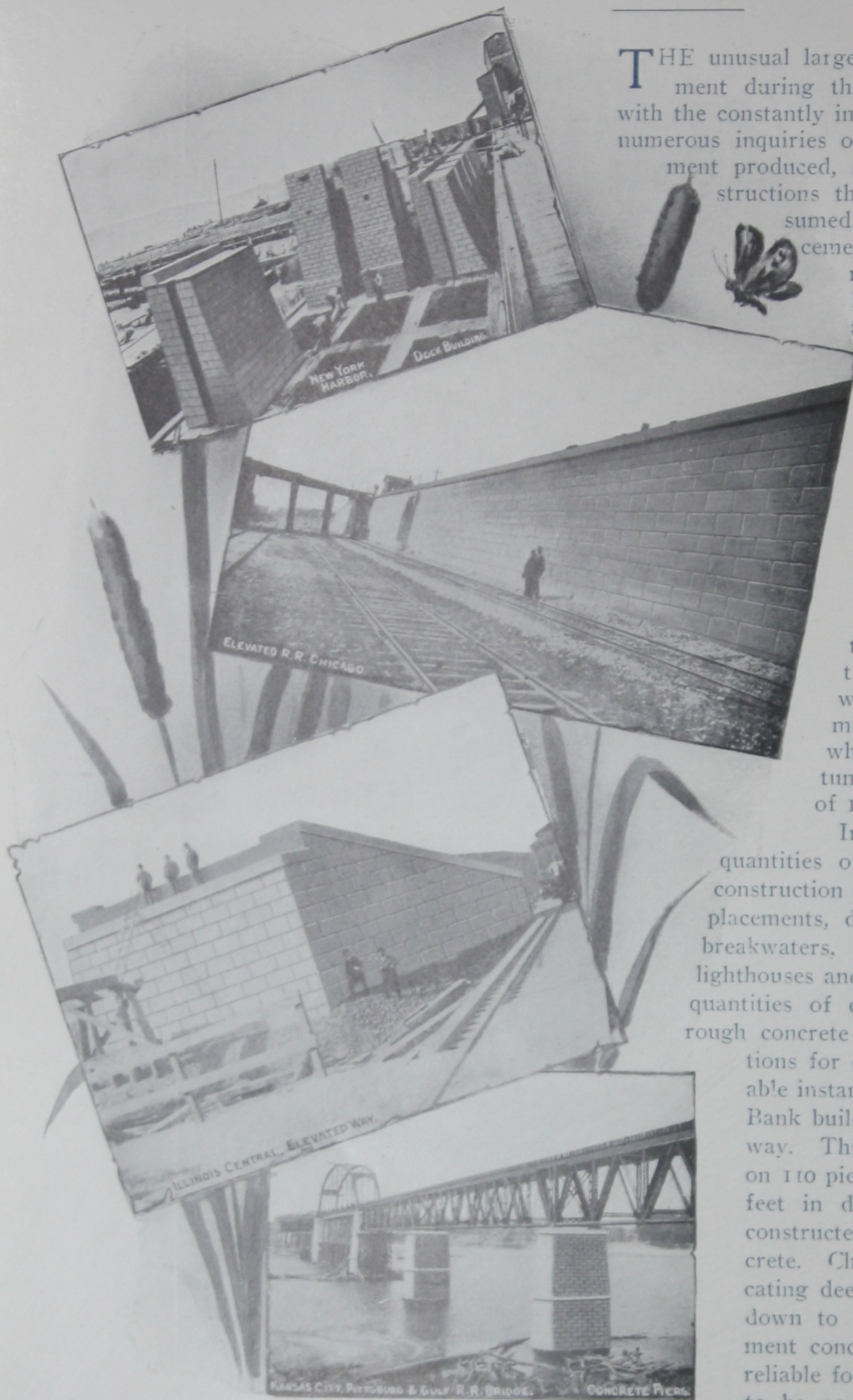
In government work vast quantities of cement are used in the construction of forts, batteries, gun emplacements, dams and locks, sea walls, breakwaters, piers, docks and jetties, lighthouses and marine dry docks. Large quantities of cement are being used in rough concrete masonry for pier foundations for office buildings, one noticeable instance being the First National Bank building at Chicago now under way. This building will be carried on 110 pier foundations from 9 to 12 feet in diameter by 101 feet deep constructed entirely of cement concrete. Chicago architects are advocating deep pier foundations, carried down to bed rock—built up of cement concrete, as the only safe and reliable foundation for high buildings to be constructed in the future in Chicago. This will call for large orders of Portland Cement. In grain elevators, large factory buildings and

power houses, concrete masonry is the favorite material. The railways find it economical to use concrete for piers, bridges, culverts, retaining walls for elevating and depressing their tracks, for floors and roof coverings in shops and depots.

The railways are likewise beginning the erection of grain elevator tanks at terminal points in armored concrete.—*Cement and Engineering News*, August, 1902.

NEW YORK'S BIG CANAL.

Cement men will profit by the construction of New York's big canal which will begin this year. The canal will connect the Great Lakes with the ocean and will cost \$100,000,000.00. It will be for deep-water craft. The amount of Portland and hydraulic cement used in its construction will furnish an important outlet for these products.



Dock foundations, retaining walls, abutments, and piers above shown are all constructed out of Portland Cement.

A SEVERE TEST OF PORTLAND CEMENT CONSTRUCTION.

For the first time in five years Niagara was out of harness Sunday, June 1. The rush of water into the great tunnel of the Niagara Falls Power Company was shut off, and the full volume of the river poured over the falls. The managers of the company wished to ascertain the condition of the tunnel after the discharge of 32,400,000 cubic feet of water each hour for five years. At 1:30 o'clock that Sunday morning a party of engineers composed of Vice-President William B. Rankine and Edward D. Adams, of the board of directors; William A. Brackenridge, resident engineer, and Clemens Herschel, consulting hydraulic engineer of the Niagara Falls Power Company, and others put on rubber suits and descended into the tunnel. Splashing along through a stream eighteen inches deep, caused by the leakage at the gates, they flashed their torches upon the walls in anxious search for signs of wear. They found none. From one end to the other, the tunnel was as strong as on the day when it was finished. The inspection was finished by 7 o'clock. The engineers returned to the surface of the earth, the gates were lifted, and one-thirteenth of the mighty stream of Niagara plunged again into the tunnel. — *Cement and Slate, October, 1902.*



Cement is Scarce.

Order for 50,000 Barrels Goes
Begging from Plant to Plant
All Over the Country.

(Special Telegram to the Despatch.)

LOUISVILLE, Aug. 17, 1902.—

A scarcity of Portland Cement is threatened in the United States, according to R. H. Evans, a local Portland Cement man. Mr. Evans had occasion recently to buy 50,000 barrels of Portland Cement for a Winnipeg concern, his company not being able to fill the order. He wrote to 22 different companies in nearly as many cities, and the best he could do was to place part of the order. A firm at Youngstown, Ohio, reported its output sold for a year ahead. Detroit refused to quote prices. "Far oversold" came the reply from one Philadelphia concern, and another reported its output contracted for, for the next ninety days. From New York, Bronson, Mich., Union City, Mich., and a dozen other points similar answers were received.—*Pittsburg, Pa., Despatch.*

Cement Concrete Outwearing Bed Rock.

The above illustrated portion of the Mechanicville Dam was built for the Hudson River Power Transmission Company, entirely of cement concrete, and is 16 feet high, extending from an island in the Hudson River to the east bank, a distance of 800 feet. The waste gates shown in the cut were some of them only ten days old when the Hudson River was diverted from its banks and run through them. On being examined the next year it was found that the exposed concrete was practically perfect, while the bed rock of the river had been excavated by the scouring action of the current, leaving holes to the depth of 10 feet in places on the down stream side, above which the cement piers overhung SQUARE-CORNERED and practically UNHARMED.

A \$9,000,000 CONCRETE AQUEDUCT.

The Mexican government has begun the construction of a \$9,000,000 aqueduct between Xochimilco and the city of Mexico which will be built of armoured concrete, using for reinforcement expanded metal. This form of construction will be very much cheaper than masonry even though there is an abundant supply of stone along the entire line. The aqueduct will be 82,000 feet long, and 6 feet wide by 5 high.

CEMENT BREAKWATER, MARQUETTE, MICH.



CEMENT BREAKWATER, CLEVELAND, O.



Over 80,000 barrels of Portland Cement were used in constructing the Cleveland Breakwater. The cut shows an angle of the Breakwater, top surface and parapet. The Marseilles jetty extends into the Mediterranean over two and a quarter miles, and is built up from large cement blocks dumped somewhat promiscuously into the sea.



CEMENT SEWER PIPE, DUARTE, CAL.



LEVEL CEMENT SEWER PIPE



WASHINGTON'S RESERVOIR WALL



SECTION OF CEMENT CONDUIT
CAPACITY 8.5 TONS OF STEEL RAILS, JERSEY CITY

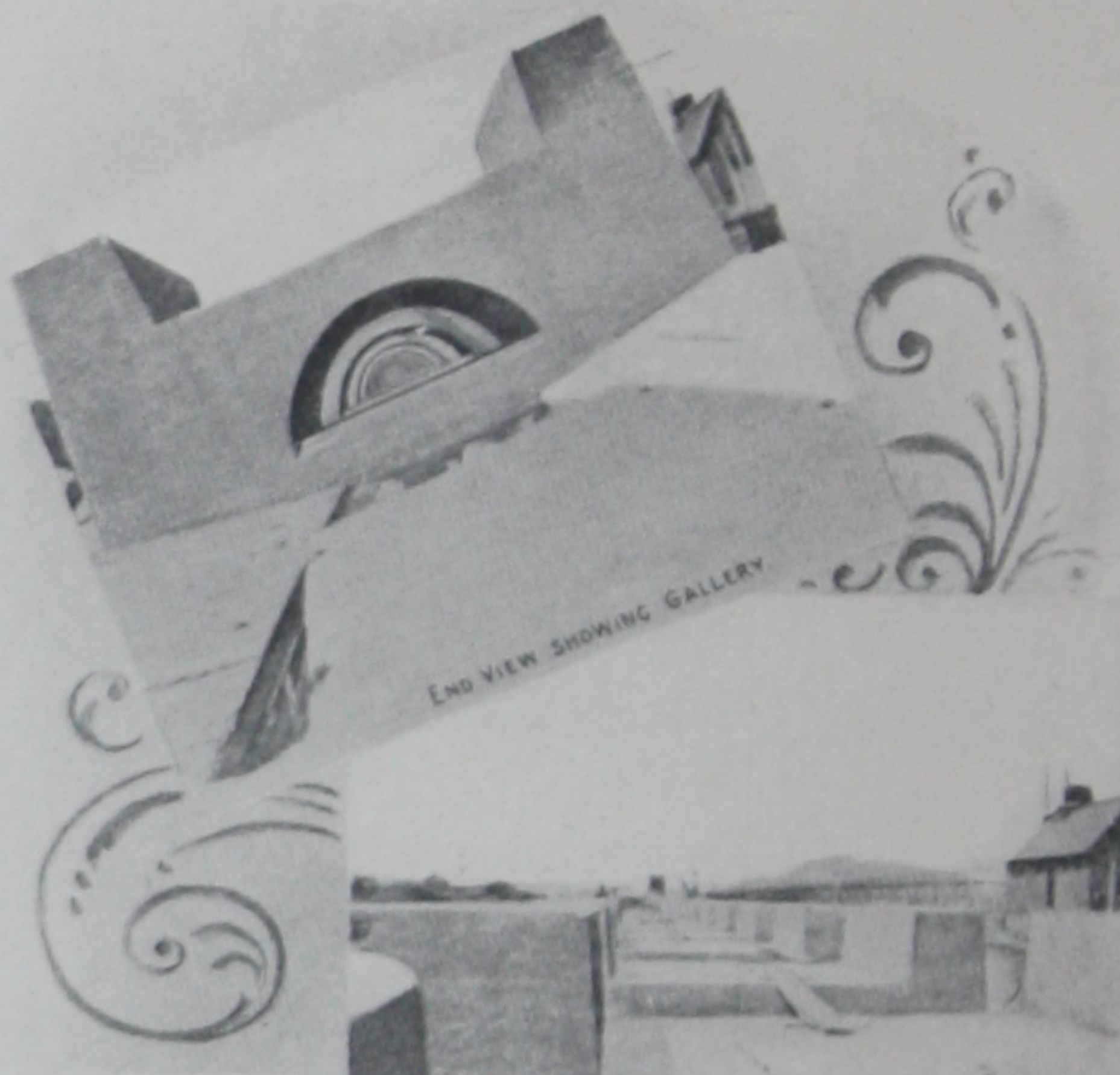
The crown of the reservoir is of solid cement concrete. The short lengths of cement sewer pipe shown are two or three feet in diameter and are made in crude molds without expensive machinery and need no burning but only maturing by being kept wet for a few days. The last cut illustrates a very remarkable test made in June, 1900, by the New York Expanded Metal Co., on a portion of the conduit for the Jersey City water supply. Fifteen days after the section had been made, 25 tons of steel rails were piled on the section. Three rails weighing approximately a ton were then twice dropped on one end on the loaded arch; all this produced only a deflection of 7-16 inch in height of arch, with a few cracks. On removing the rails a half month later the arch resumed its original form with practically no damage.

Concrete for Sewers.

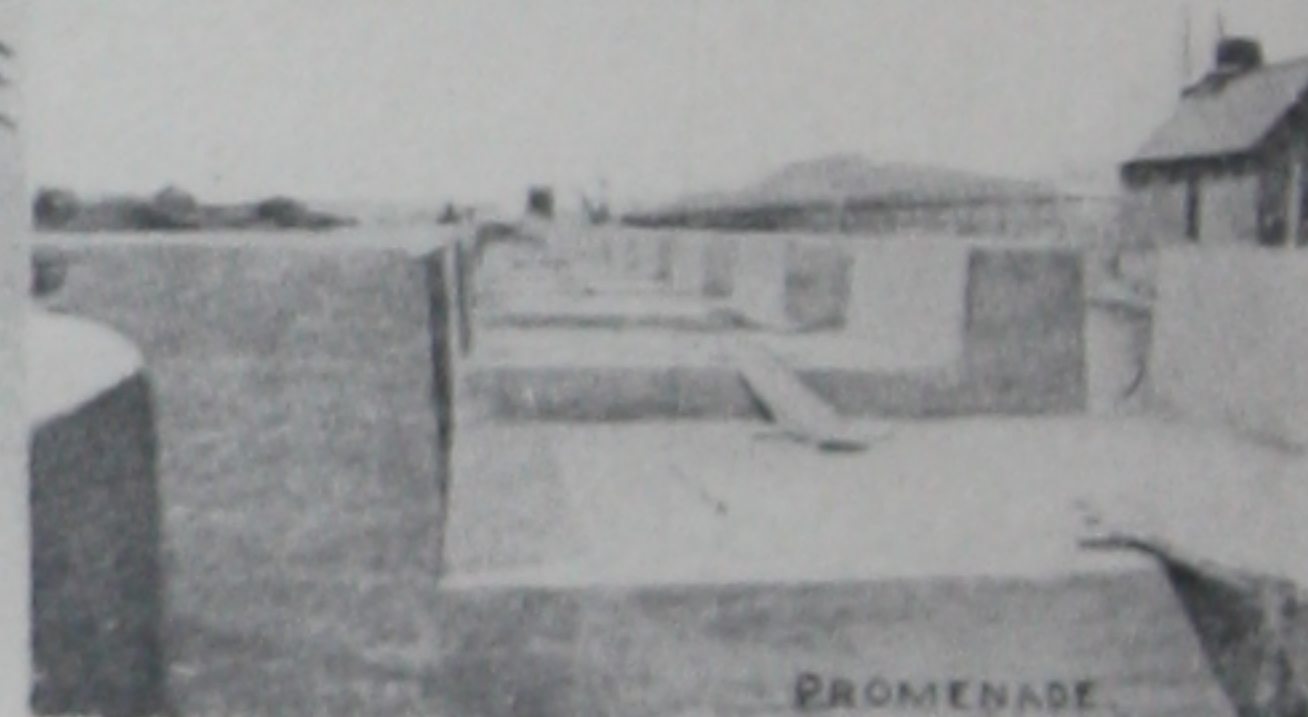
The propriety of including concrete construction in the specifications for the building of sewers is being contemplated by the board of public works and City Engineer Harper. It is said that concrete has taken the place of brick for sewers in a number of cities, and at a generally reduced cost to the taxpayers. Concrete is said to be as efficient, if not more desirable than brick.

"With concrete in use for the construction of sewers," said Engineer Harper yesterday, "I feel confident in saying it would mean a saving of 15 to 20 per cent over brick. No expertness is required in the laying of concrete sewers. Forms are simply built and the mixture is shoveled into these forms. This can be done by ordinary labor, and does away with brick layers who demand 80 and 85 cents an hour for their services."

—Kansas City Journal, Feb. 6, 1906.



END VIEW SHOWING GALLERY



PROMENADE

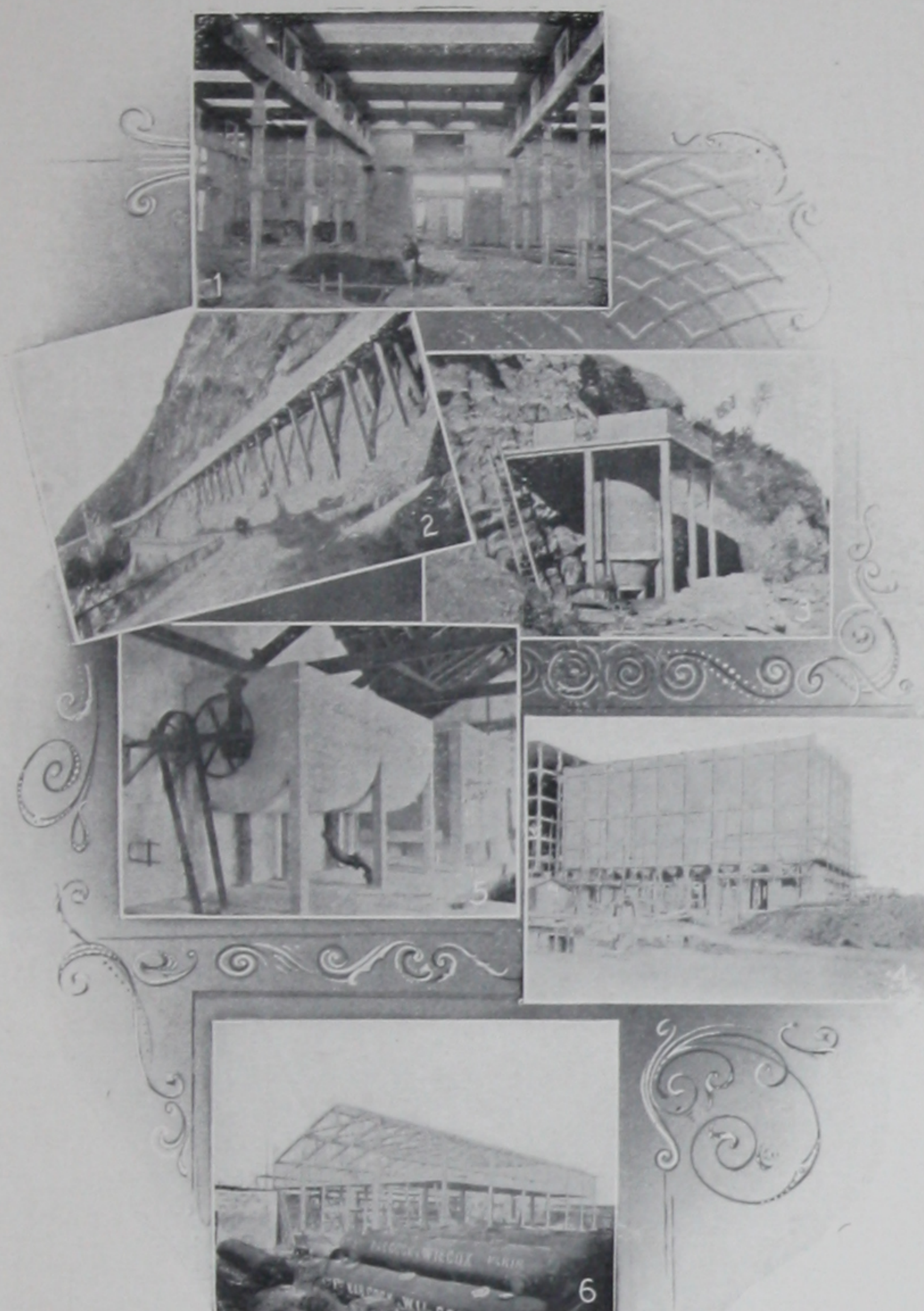


SIDE VIEW SHOWING ALTERNATING BLOCKS

Portland Cement Work, Duluth Ship Canal.

The south canal pier at Duluth, Minn., done in blocks of concrete weighing 100 tons each, laid in alternate sections.

The U. S. Government will spend over a million dollars in making protective piers for the harbor entrance at Superior, Wis., 6 miles from the above piers at Duluth. In the office of the Government Engineers at Duluth, Minn., specifications are now being made out. These will be the largest monolithic cement concrete piers ever built in the U. S. They will be solid concrete from the foundation, 25 feet below water level, to the top, 10 feet above water, and they will be 3,200 feet long. Several hundred thousand barrels of Portland Cement will be required.—Cement and Engineering News.



Hennebique Structures.

No. 1 shows construction of the Singrun machine shop at Golbey, entirely framed in concrete, including beams to support a movable crane of 30 tons weight.

No. 2 gives a view of the Simplon canal, built along the abrupt mountain side to conduct the water of the Rhone for motive power to Brigue, Switzerland, a distance of two miles. The canal itself and the entire trestle work supporting it are built out of concrete.

No. 3 shows a lime kiln at Luzech built out of cement in which a constant temperature of 1,200 degrees heat is maintained.

No. 4 is the picture of a cement grain elevator at Strassburg, containing 45 bins each 50 feet high.

No. 5 gives interior view of a paper mill at Pelgues. Cement pulp-vat floors and partitions are noteworthy.

No. 6 illustrates a use for Portland Cement entirely new in America, but very popular in Europe. It shows the complete framing of a building in concrete, girders, plates, rafters, all formed in cement by the Hennebique system. The structure is erected for the Babcock & Wilcox Co., and employs cement girders of 40-foot reach.

Kansas City Flood Protection.

Engineers of the United States Army who were detailed to make examinations along the Kaw River bottoms at Kansas City, Mo., with a view to construct protective walls at that point, have reported to Congress and recommended an appropriation sufficient to build a concrete wall on both banks of the river, 30 feet above low water mark and extending for nearly two miles up from the mouth of the river. The bottoms at this point contain extensive industries of various kinds aggregating millions of dollars which is jeopardized each year by the high water. Much individual effort has been made to protect property by constructing their buildings of Portland cement concrete, and surrounding them with concrete walls. It is reported that Nelson Morris alone used one hundred thousand barrels of cement last year.



The Columbia, one of the cruisers belonging to the United States Navy, is lined with Portland Cement. This material at the age of one year will stand a crushing strain of 220 tons to the square foot. Portland Cement gives twice as great buoyancy as the steel which it replaces.

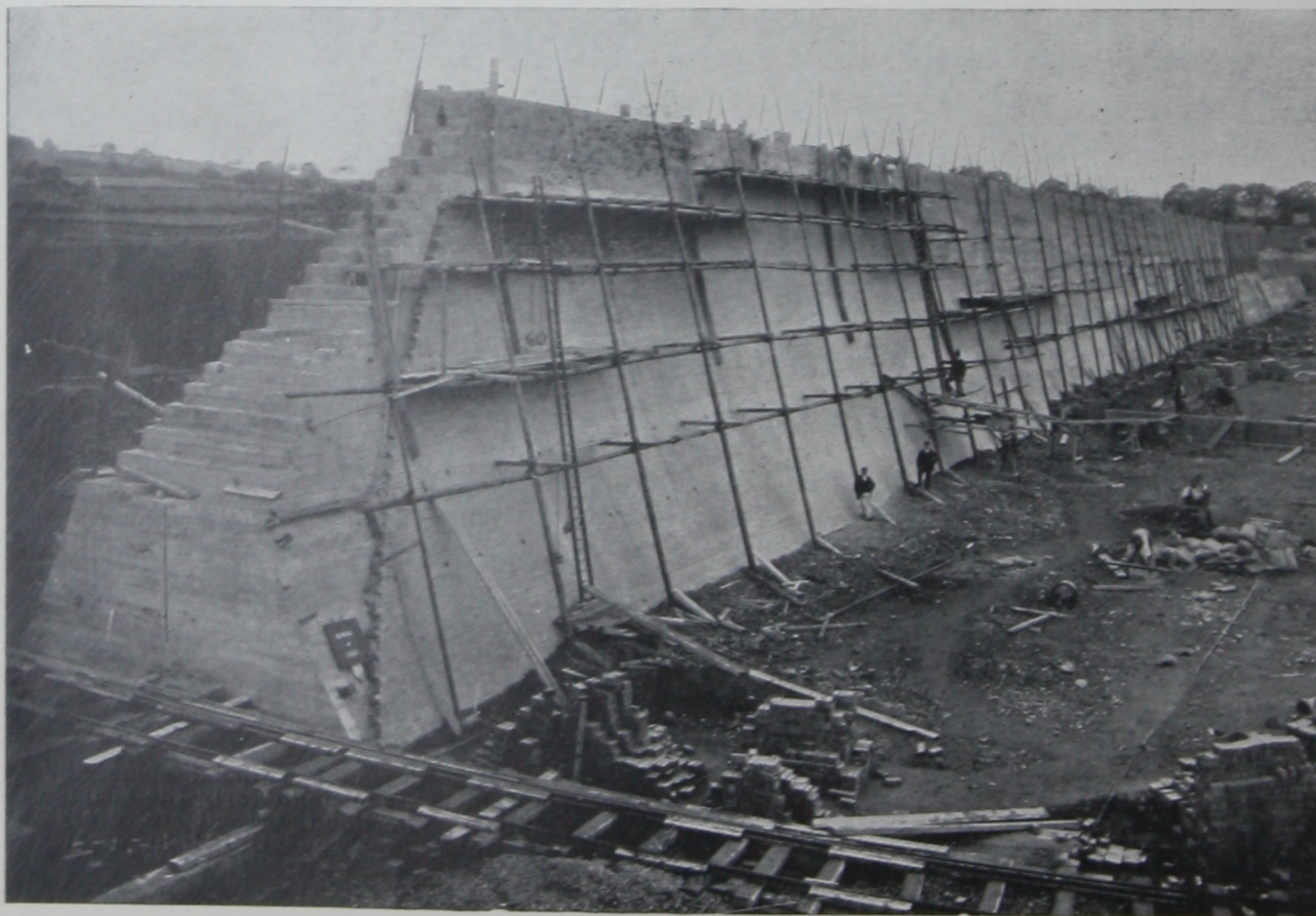


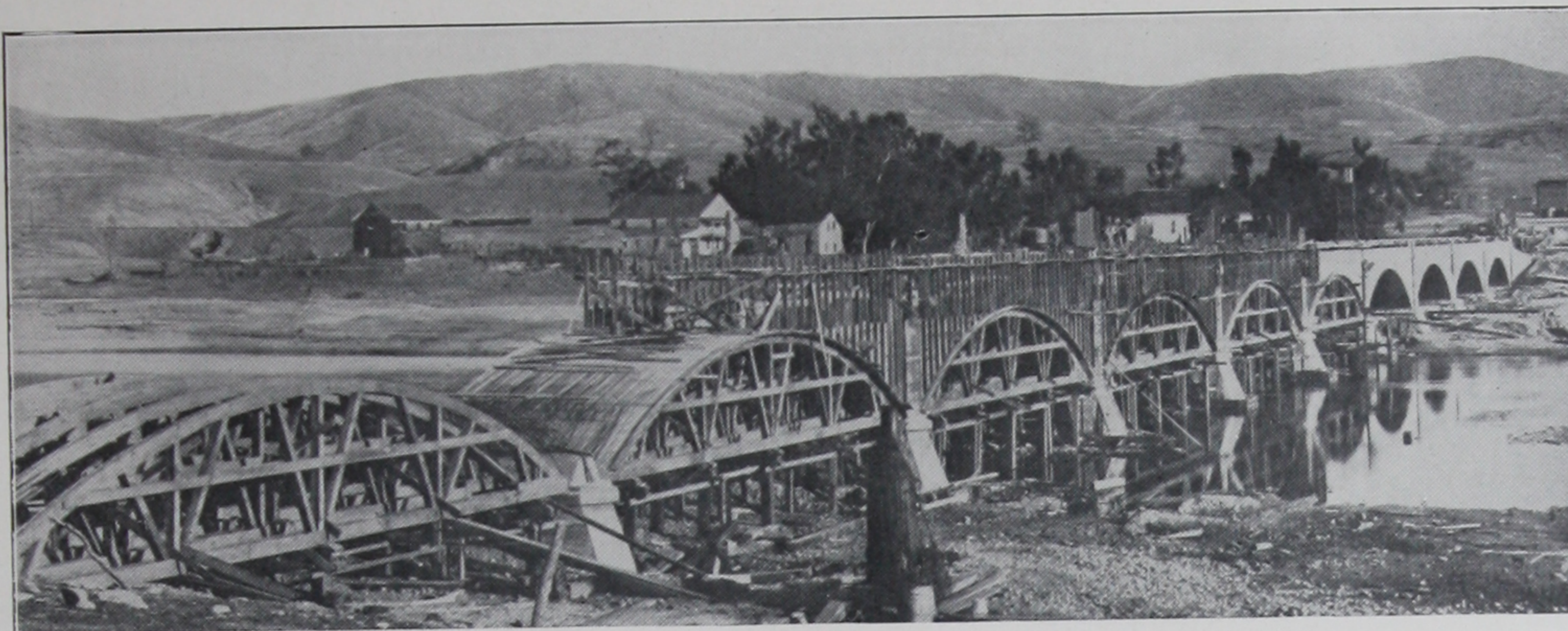
Various forms of artificial stone already in use, showing clearly the adaptability of Portland Cement to every conceivable problem involved in architecture.



The new waterworks scheme for Birmingham, England, now on the eve of completion—the greatest water scheme that has ever been attempted—a work involving the use of many THOUSANDS OF TONS of Portland Cement. The water is first stored amongst the mountains in six cement reservoirs, the total storage capacity of which is 17,360 million gallons, and they cover an area of 1,499 acres. From the storage reservoirs the water is conducted 80 miles across country, through mountains and over valleys and rivers by the aid of cement bridges, culverts, walls, tanks, tunnels, etc., to the large cement service reservoirs and filter beds shown in illustration here. Of cement concrete work there are $8\frac{1}{2}$ miles of tunnels, 35 miles of cut and cover, and $34\frac{1}{2}$ miles of iron pipes—the cut and cover and tunnels being 8 feet in diameter.

The site of this extensive concrete reservoir shown above, covers a space of three-quarters of a mile in one direction and $1\frac{1}{4}$ miles in another. The walls, formed entirely of Portland Cement concrete, are 16 feet thick at the base and about 35 feet in height. The water is delivered from this reservoir into a series of 18 quadrangular filter beds, ranging from 150 to 220 feet square, and forming a total filtering area of 67,000 square yards. These filtering beds are also wholly constructed of Portland Cement concrete.—*Cement.*





Pollaski Concrete Bridge in Course of Construction.

Perhaps the greatest piece of cement work ever attempted on the Pacific Coast is the building of the Pollaski bridge spanning San Joaquin River, which strenuous stream forms the boundary line between Madera and Fresno Counties. The above cut shows part of the bridge completed and the forms in place ready to receive the concrete for the balance. There are 10 spans in the bridge, each 75 feet long. Including approaches the structure is over 800 feet in length.

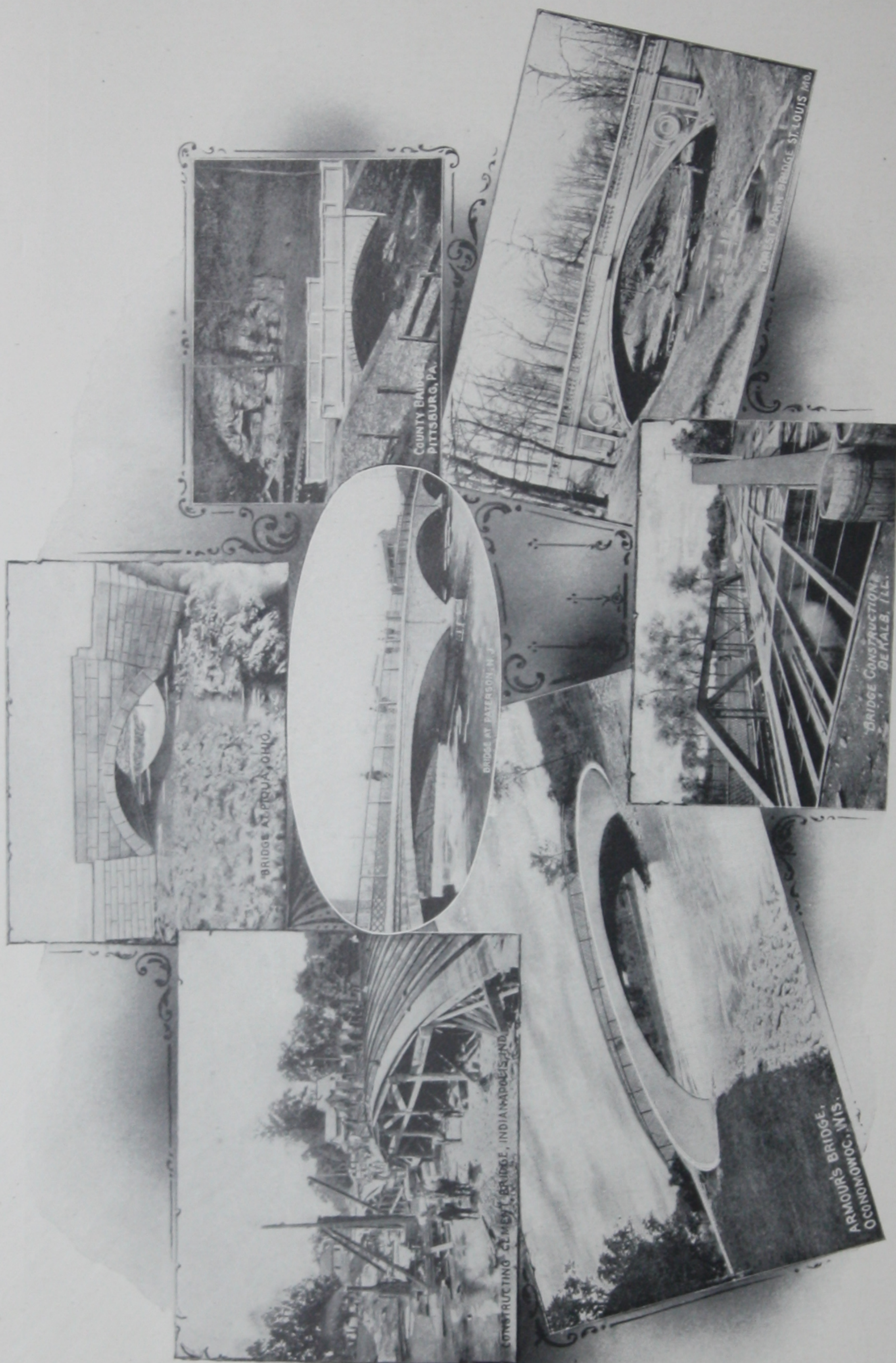


Monolithic Concrete Railway Bridge of the San Pedro, Los Angeles & Salt Lake Ry., being 984 feet long, 70 feet high, 17 feet wide and costing \$200,000.00. The arches have a clear span of 86 feet and 9 inches and a rise of 36 feet and 9 inches from the spring to the crown. The arch at the crown is 42 inches deep. The arch construction was made of Portland Cement, mixed 1 cement, 2 sand, and $4\frac{1}{2}$ crushed stone. The mix for spandiel walls was 1 to 11. This railroad has made extensive use of concrete in the construction of bridges, viaducts, water tanks and passenger stations. It has already constructed 12 standard concrete water tanks.



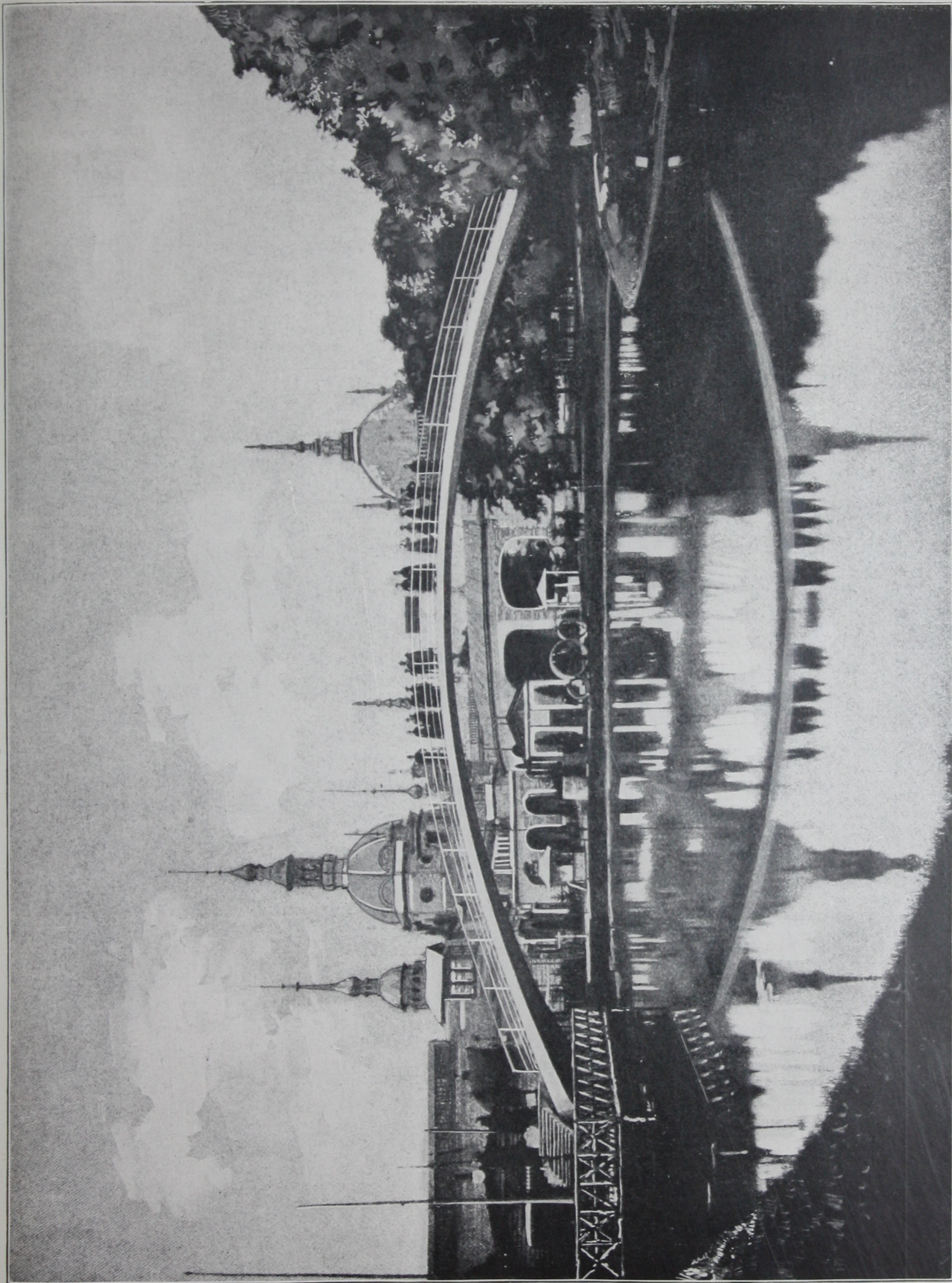
Thacher Concrete Viaduct.

Over West Kennedy Creek and the N. Y. C. & H. R. R., at Herkimer, N. Y., on the line of the Utica & Mohawk Valley Railway. Total length 1210 feet. Designed by the Orborne Engineering Co.



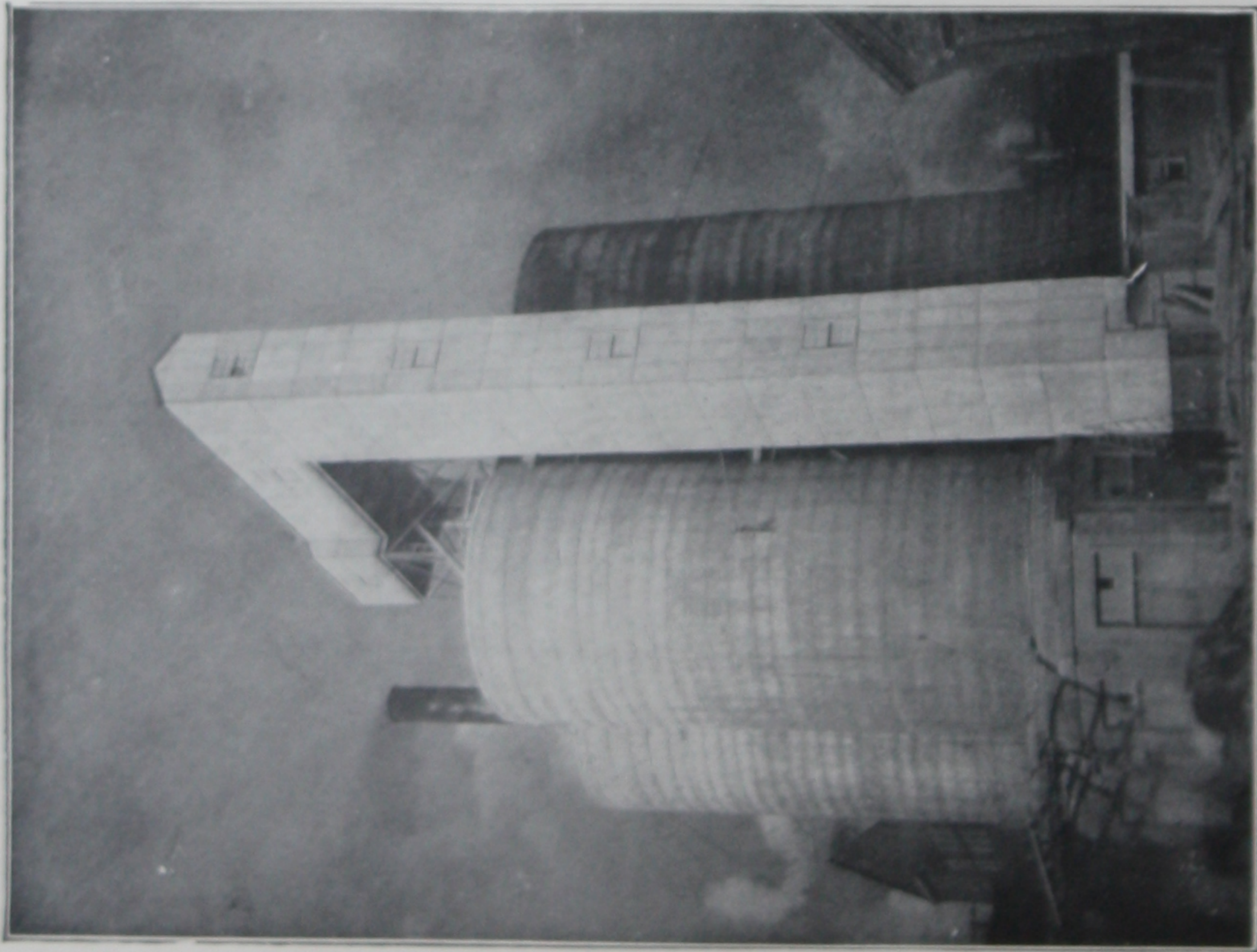
Cement Bridge Construction.

The Pique Bridge is a cheap, plain but durable style for small bridges in rural districts. The Indianapolis Bridge illustrates the method of imbedding iron beams in cement concrete for the Melan Arch. The Armour Bridge shows the graceful low flat span possible in the Melan Arch system of bridge construction. The DeKalb Bridge has a floor of cement concrete slabs held in place by steel I-beams. The railing as well as the arch and floor of the Pittsburg Bridge is made out of Portland Cement, expanded metal being used in its construction. The Paterson Bridge has three flat Melan arches, from 89 to 95 feet in length. It spans the Passaic River in the heart of the city of Paterson, N. J., and is 54 feet wide. It carries a double track electric railroad and heavy traffic. The St. Louis Bridge shows elaborate decoration possible on the concrete arch. The entire structure, including face and railing with balusters, is molded from Portland Cement.



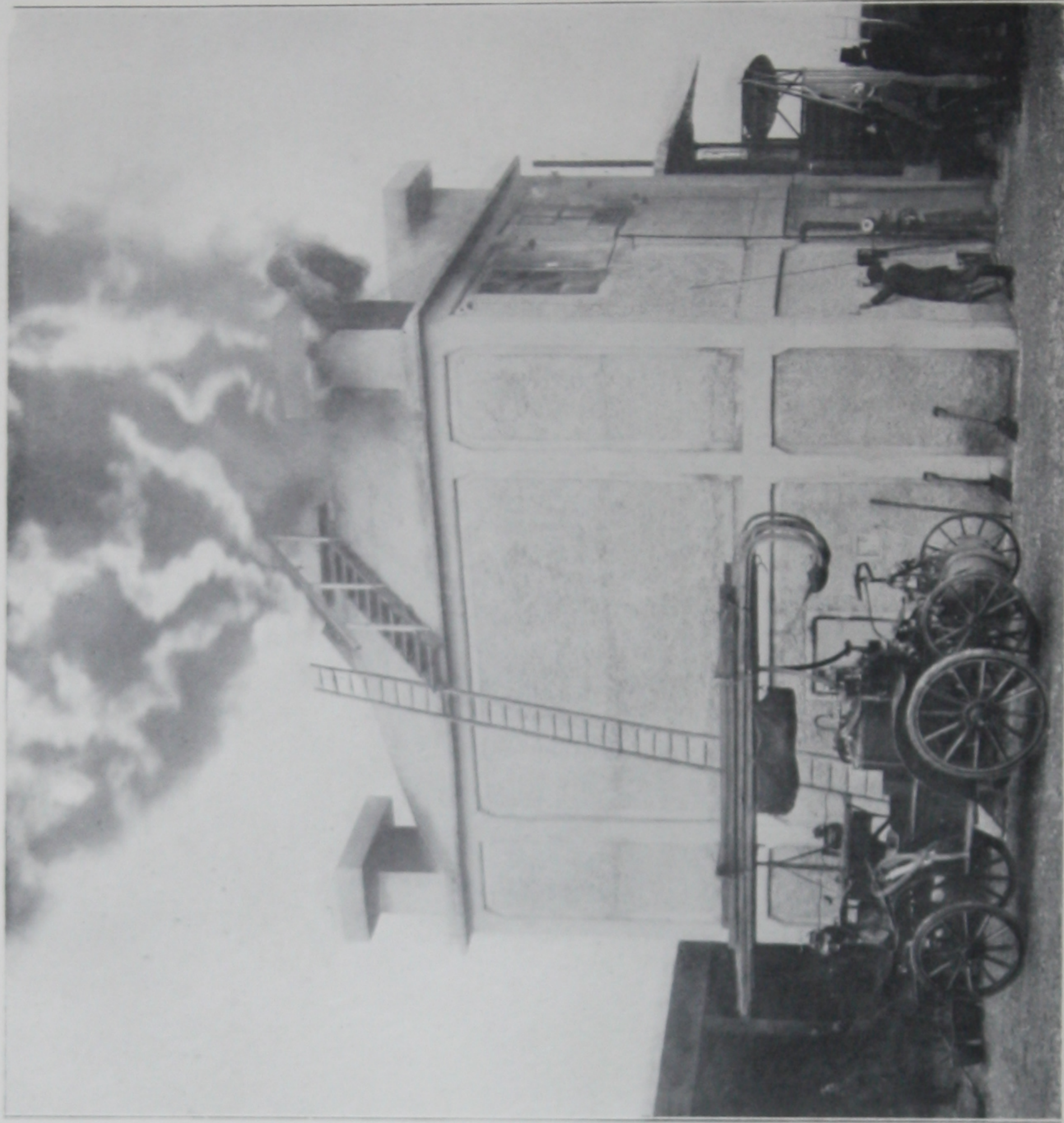
Portland Cement Bridge.

A most wonderful demonstration of the strength and beauty of Portland Cement concrete bridge construction, built at the Northwestern Trade and Industrial Exposition, Bremen, Germany.



Portland Cement Concrete Storage Tanks.

The above engraving shows two of the four cement concrete storage tanks of the Illinois Steel Company, at South Chicago, Ill. They are 25 feet in diameter by 50 feet high. The bin walls are 7 inches thick at the bottom and 5 inches thick at the top.

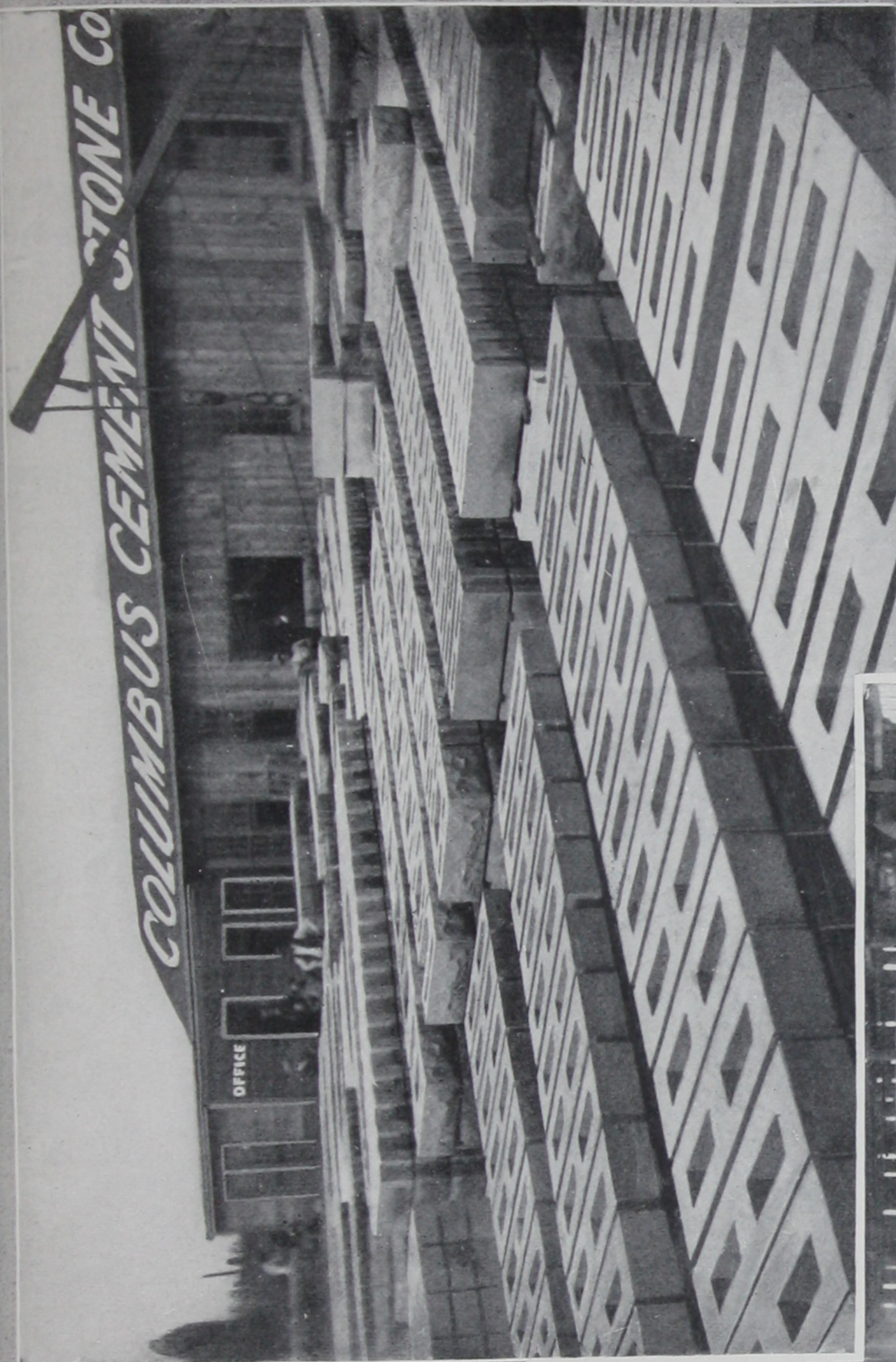


Theatre Fire, Ventilators Closed, Curtain Up.

Soon after the Iroquois theater fire a reinforced concrete model theater was constructed at Vienna for the purpose of studying theater fires. The exterior walls are only 2 3/4 inches thick. This building has been filled with combustible matter and many experiments have been held and in every instance the reinforced concrete stood all the fires perfectly. "We produce from Cement and Engineering News."

Street Railway Carshops at St. Paul.

One of the most notable jobs in concrete construction under way at present, is the car shops of the Twin City Rapid Transit Company at St. Paul, Minn. The buildings and yards will occupy a space of 40 acres at University and Snelling Avenues and when finished will be the largest and most complete shops of the kind in the world. The improvements will cost upwards of \$500,000. The plans call for a store house 100x300, mill 75x200, power house 50x100, paint shop 126x300, machine shop 150x200, smith 50x200, foundry 60x200, wheel shop 50x200, transfer table 60x200, erecting shop 100x200, and a transfer table 90x300, making a floor space of over 262,800 square feet. The form of construction employed is a combination of reinforced concrete, hollow blocks and cement brick. The foundations are of solid concrete, columns, pilasters, roof trusses, floors, etc., are of reinforced concrete, while the partitions and curtain walls are of hollow blocks and the exterior veneered



with cement brick. Six hundred thousand cement hollow blocks and about four million cement brick will be required. Plain round steel is being used for reinforcement in beams and columns and the International system of reinforcement is used for floors and roof construction. Concrete and nothing else from start to finish—no structural steel, clay, brick, or natural stone used—verily this is the age of cement concrete. It is constructions of this class that are giving to the industry the highest standing among architects, engineers and property owners.

THE WASHBURN-CROSBY MILLING CO., of Minneapolis, has recently erected a machine shop of reinforced concrete, 60x80 feet and four stories high. It is interesting to note that this is in a location where natural stone is very plentiful and that all the large flour mills of this company were built of stone, until the advent of concrete construction.

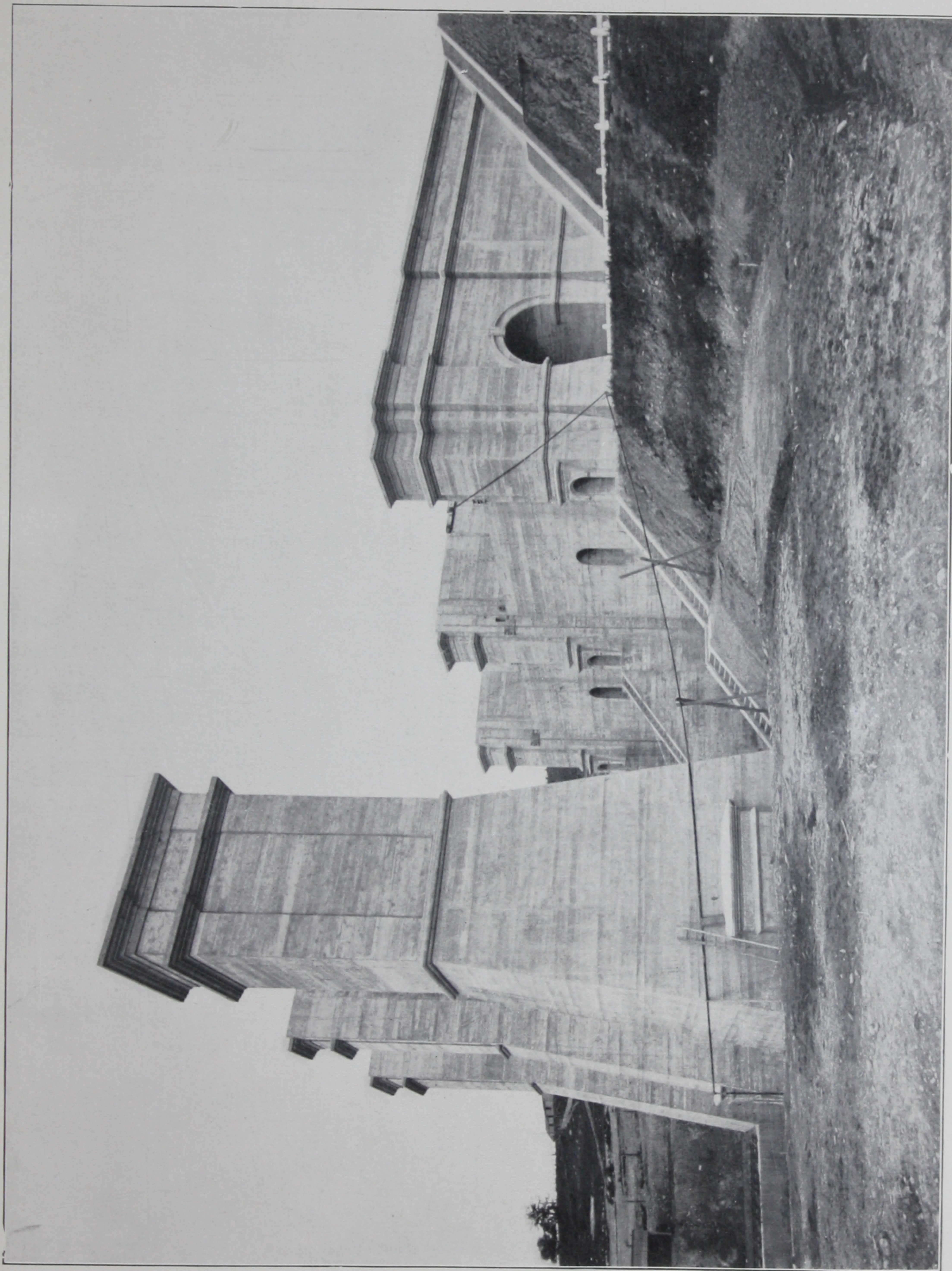
There are over 5,000 concrete block building plants in operation in the United States. There are about 50,000 concrete contractors, 20,000 dealers in Portland cement and upwards of 9,000 architects and engineers who use cement products, which number is being added to every day quite materially. The future of cement construction seems practically without limit.

Hollow Cement Concrete Building Block Factory—Five Normandin Machines in Operation.



Ammonia Tanks, Racine, Wisconsin.

Built entirely of Portland Cement concrete and expanded metal. They are used for the storage of tar and ammonia. The resistance calculated is 500 lbs. per square foot. The concrete used was one part cement, two parts sand and five parts broken stone. They have been in use since 1900, and have answered every requirement without damage or harm.



The 65-Foot Lift Lock on the Trent Canal, Peterboro', Ont.

This Lock is the largest of its kind in the world, and is constructed entirely of Portland Cement concrete, over 30,000 bbls. being used.



St. James P. E. Church, Brooklyn, N. Y.
Constructed entirely of Portland Cement.

ST. JAMES P. E. CHURCH, BROOKLYN, N. Y.

THE illustration on opposite page is a reproduction of a photograph of St. James P. E. Church, located at St. James place and Lafayette avenue, Brooklyn, N. Y. It covers an area of over 11,000 square feet, and has four gables 60 feet high and a tower 80 feet high. It represents the most artistic and substantial building constructed of cement concrete in America, and it is doubtful if in the world there is a more convincing argument in favor of cement construction. The application of cement concrete for building operations of an artistic nature is generally misunderstood; the completion of St. James Church is, therefore, a lesson of much value to the directors of building operations.

One cannot doubt, as he views this magnificent structure, that the successes of the early Roman builder in applying cement concrete for important engineering and architectural operations will be surpassed in the present generation. The early Roman architects and builders have given to the present age the testimony of their faith in works of cement concrete that have endured the ravages of time and still exist side by side with natural stone, offering evidence to the fact that their judgment as to the durability of concrete was correct in every respect. The production of a cement suitable for this class of construction was discontinued and remained for ages among the lost arts until 1824, when the discovery of a process for treating limestone gave the world Portland Cement. Since the date of its first manufacture a continual improvement has been made in its quality, until to-day a cement of superior quality is being manufactured. The modern builder has familiarized himself with its advantages and studied its nature. The manufacture of cement has become a science and its application a study by the most progressive engineers of the world. The specialist in concrete construction became a necessity occasioned by the rapid progress made in adapting cement to many and varied uses and conditions. It is a safe conclusion, judging from the record of the past few years of wonderful progress made in Europe and America, in developing a true understanding concerning cement and its uses, to prophesy that the engineer and the architect of the present day will give to posterity examples of their best creations built of cement concrete.

Upon viewing St. James Church one is impressed with the general appearance of the entire work. The color is beautiful and even, and while appearing as if constructed of the highest grade ashlar from a distant view, shows its superiority in general effectiveness upon a closer inspection. It has an exterior appearance of rock-faced massive granite; and from the standpoint of durability and beauty it is admitted to be much superior to a church that stands near by constructed of natural stone at three times the cost.

HOUSE FACTORIES.

One of the pleasing possibilities of the concrete industry is that we may have in the near future a multitude of "house factories" which will make complete houses and deliver and erect them for every man who wants a home. The question of transportation offers no obstacle. The cement, sand and stone have to be transported to the place where the concrete house is to be erected, and the cost would not be much greater than to carry them separately.

In erecting houses or ornamental structures of cut stone it is customary to number each piece at the quarry and the contractor places each stone where his plans direct him to place it. The steel work for an office building, a bridge or an elevated railroad is handled in the same manner, each piece being numbered and made to fit in one place and nowhere else. In the same manner concrete blocks could be turned out in a factory, each one planned and numbered to go in its proper place.

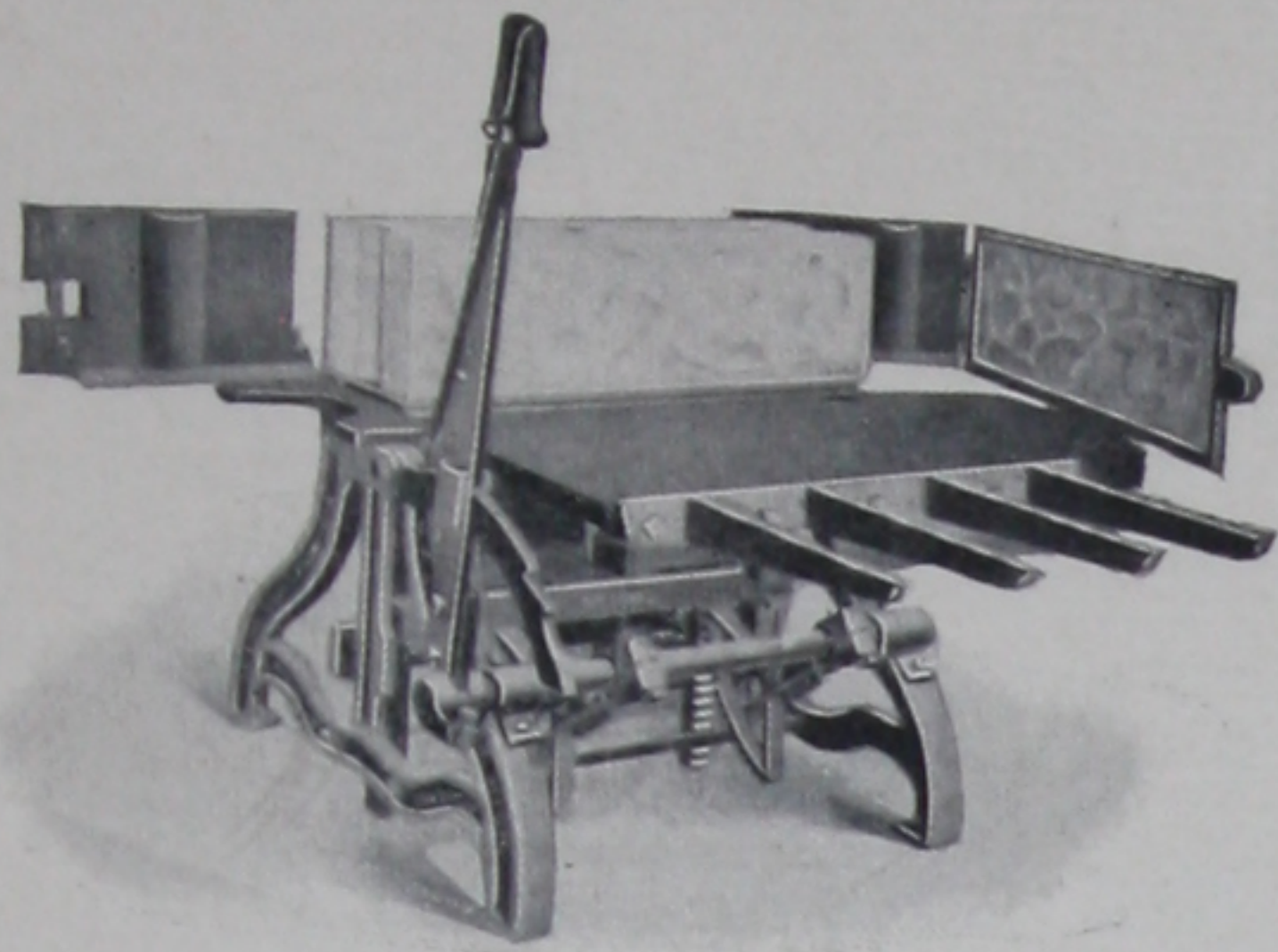
A "factory" equipped with the proper machinery for handling the materials could make better and cheaper blocks than a contractor working on the ground where his building is going up, especially if the work of the contractor is left to a foreman who has had little experience in handling concrete, with a gang of men who have had no experience at all. The "factory" would save a great deal more than the difference in freight charges on the crude materials and the finished blocks.

Under present conditions, the contractor with a shovel can only erect the mere shell of a building. The factory, with a trivial expenditure of labor and materials, could add a thousand little details that would appeal irresistibly to the taste and the purse of the man who is building a home and each piece could be molded and numbered so it would fit into its appointed place with a minimum of labor in erecting. The ceiling with square corners, for example, does not appeal to the human eye, and the man who can afford it wants arched ceilings or mouldings which present artistic curves to the eye rather than straight lines and square corners. In a "house factory" the ceiling and floors could be molded in any manner desired of reinforced concrete, casting them in sections, which can be fitted and cemented together when the house is erected.

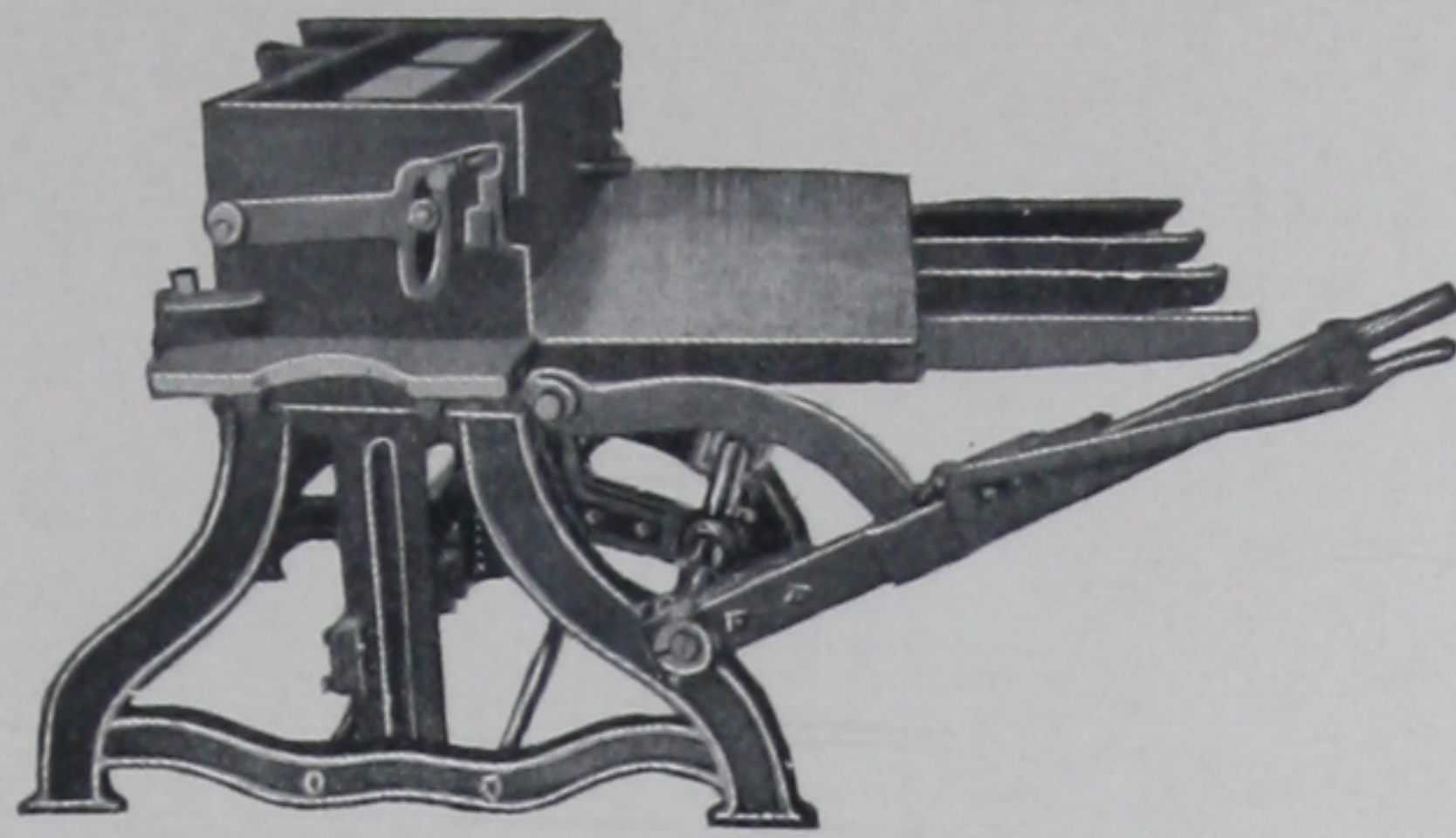
The house factory would not have to turn out all the houses in the same color and from the same plans. Concrete can be given any shade of color that may be desired, by using mineral pigments in the surface materials. The factory could afford a variety of molds or patterns which is entirely beyond the reach of the local contractor of the present day, so that it would be unnecessary to make two houses alike.

The man who wants to buy or build a house would find his task very simple. The factory could show him plans and designs, and when he found something that suited him, he could probably be directed to a house already built on the same plans, which he could examine in detail, so that he would see exactly what the factory proposes to give him, and he might be glad to make a trip of 100 miles to examine such a house before placing his order.

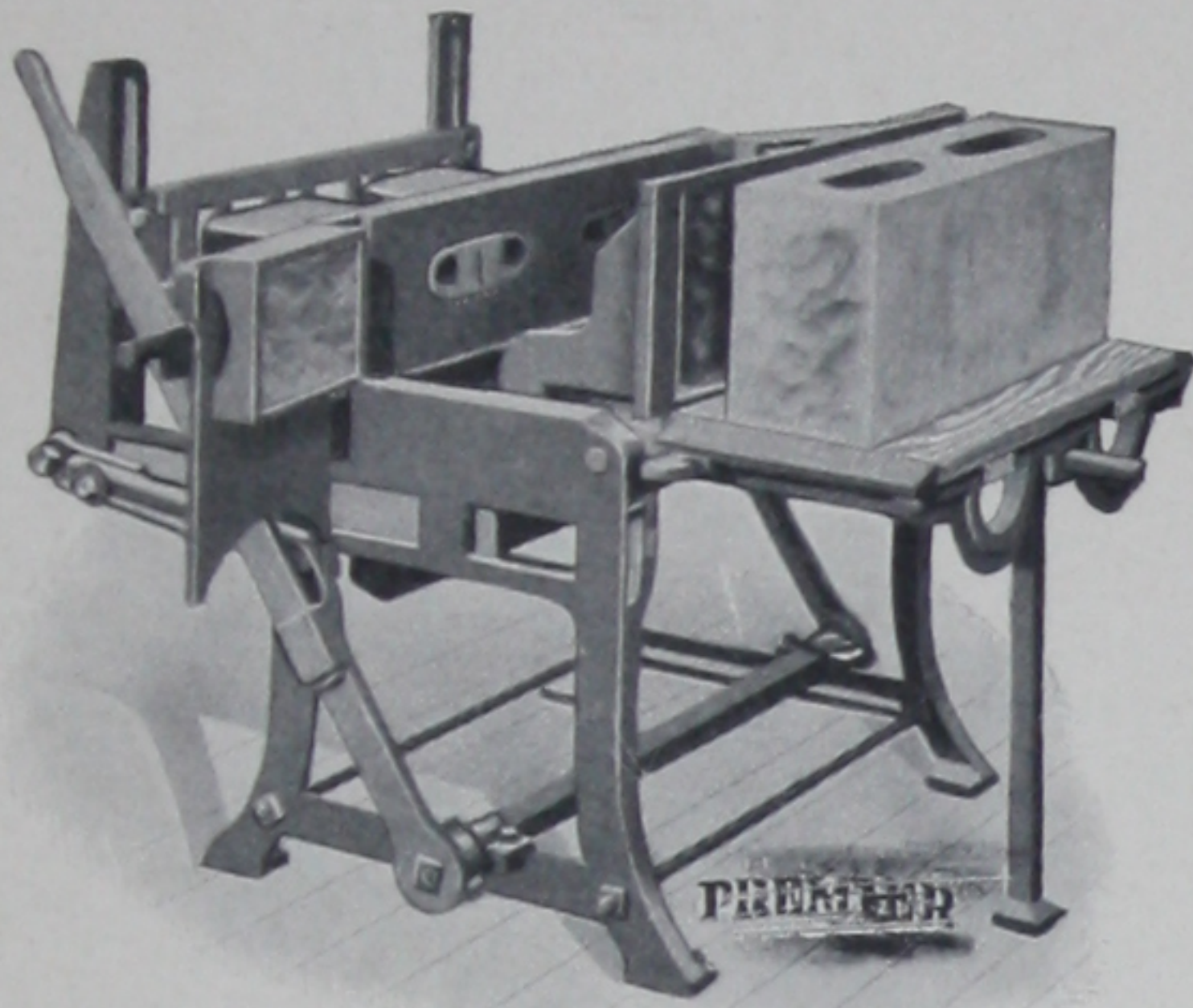
There would be no fear of overproduction in the cement industry for many years to come if the "house factory" business alone could be established. A man can spend \$5,000 for a house under present methods of construction and not get a great deal for his money, and may find that it is not just what he wanted after he does get it. If, however, a man could order a house just as he would order a piano or a suit of clothes, and have it ready to move in within 30 days after he places the order, the home problem would be solved for a million families in the United States who live in apartment caves and cliffs because the problem of building and owning a home under present methods is so uncertain and expensive.



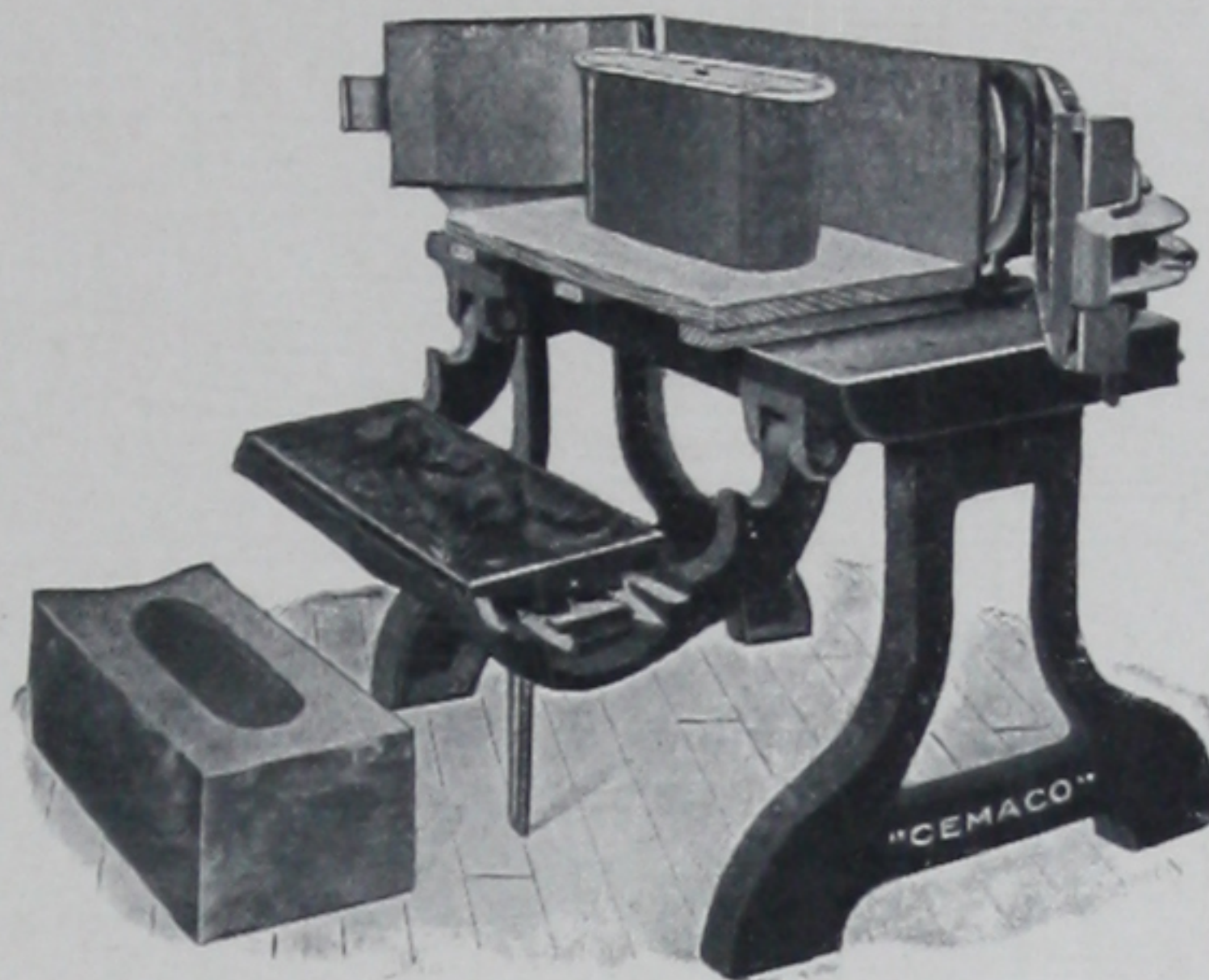
Normandin Style B, Concrete Block Machine.



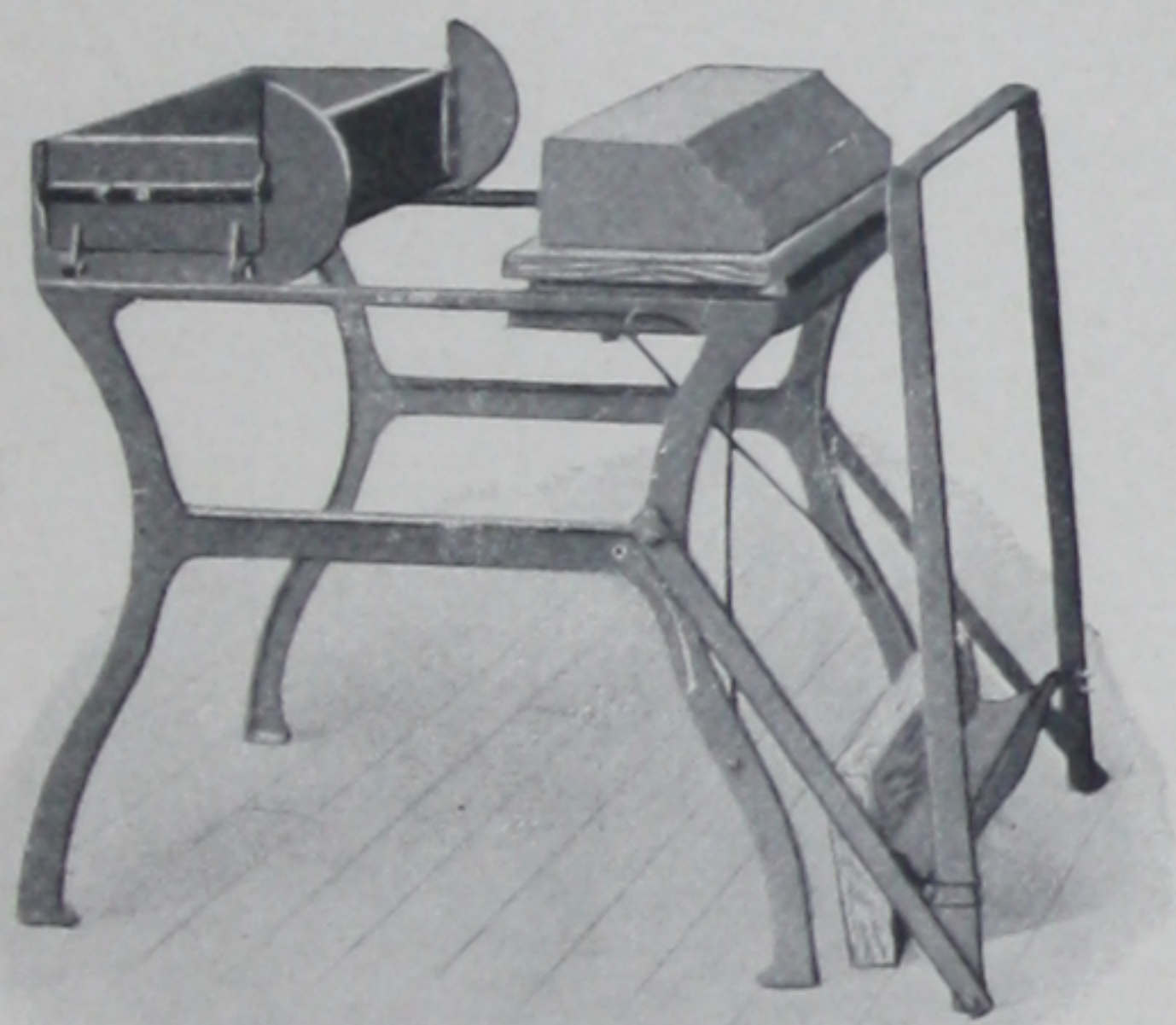
Normandin Style C, Concrete Block Machine.



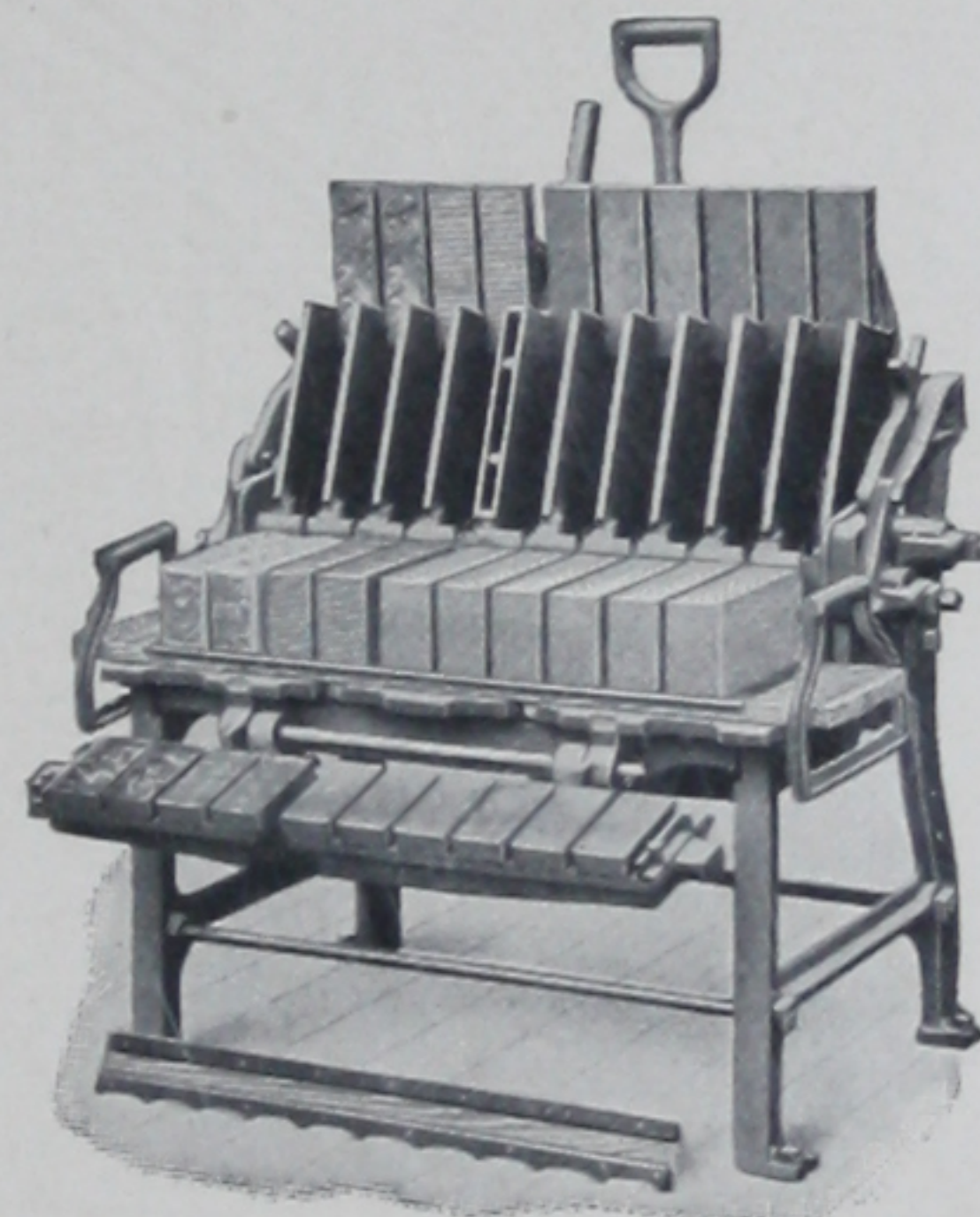
Peninsular Face Down Concrete Block Machine.



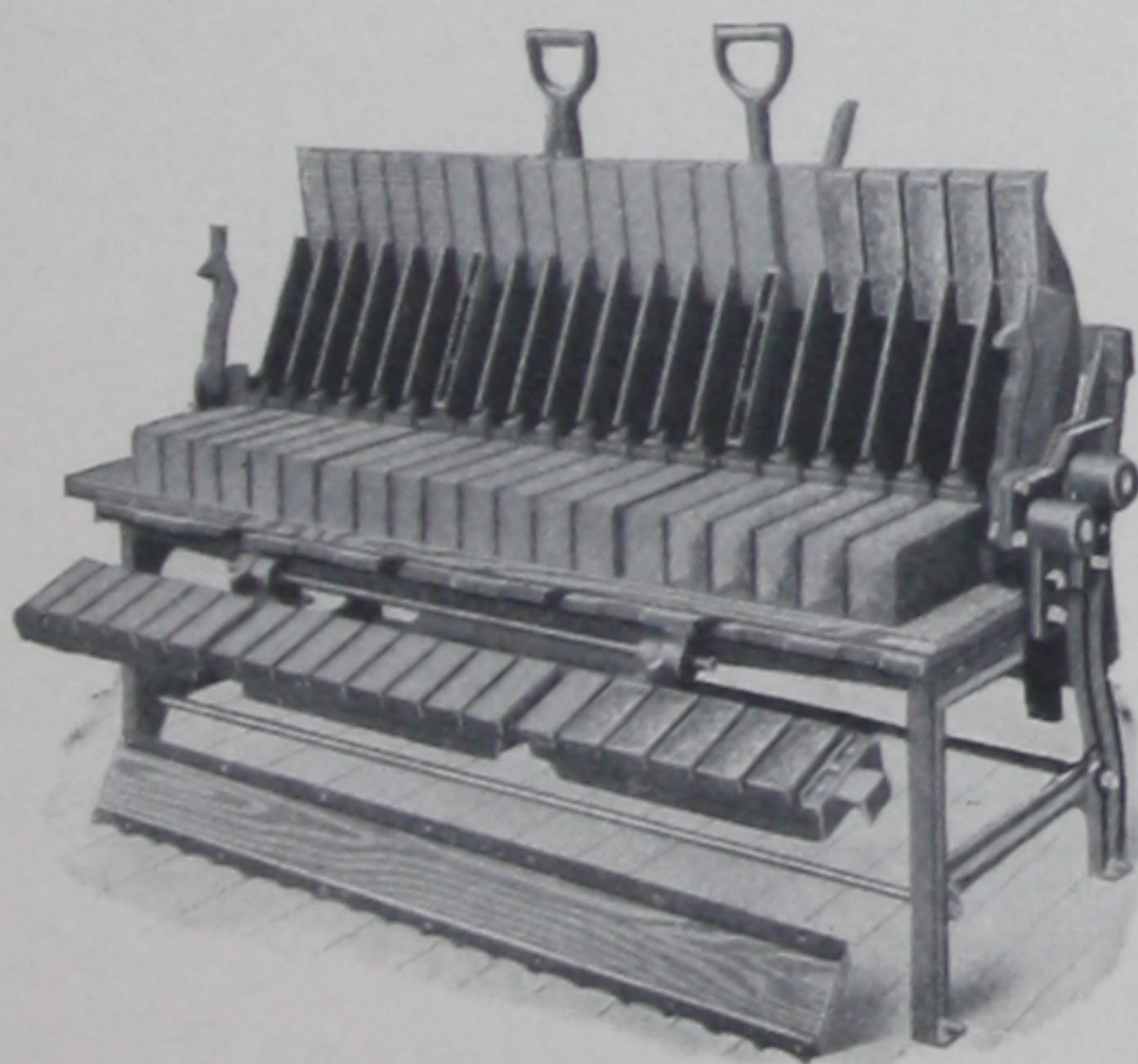
Cemaco Concrete Block Machine.



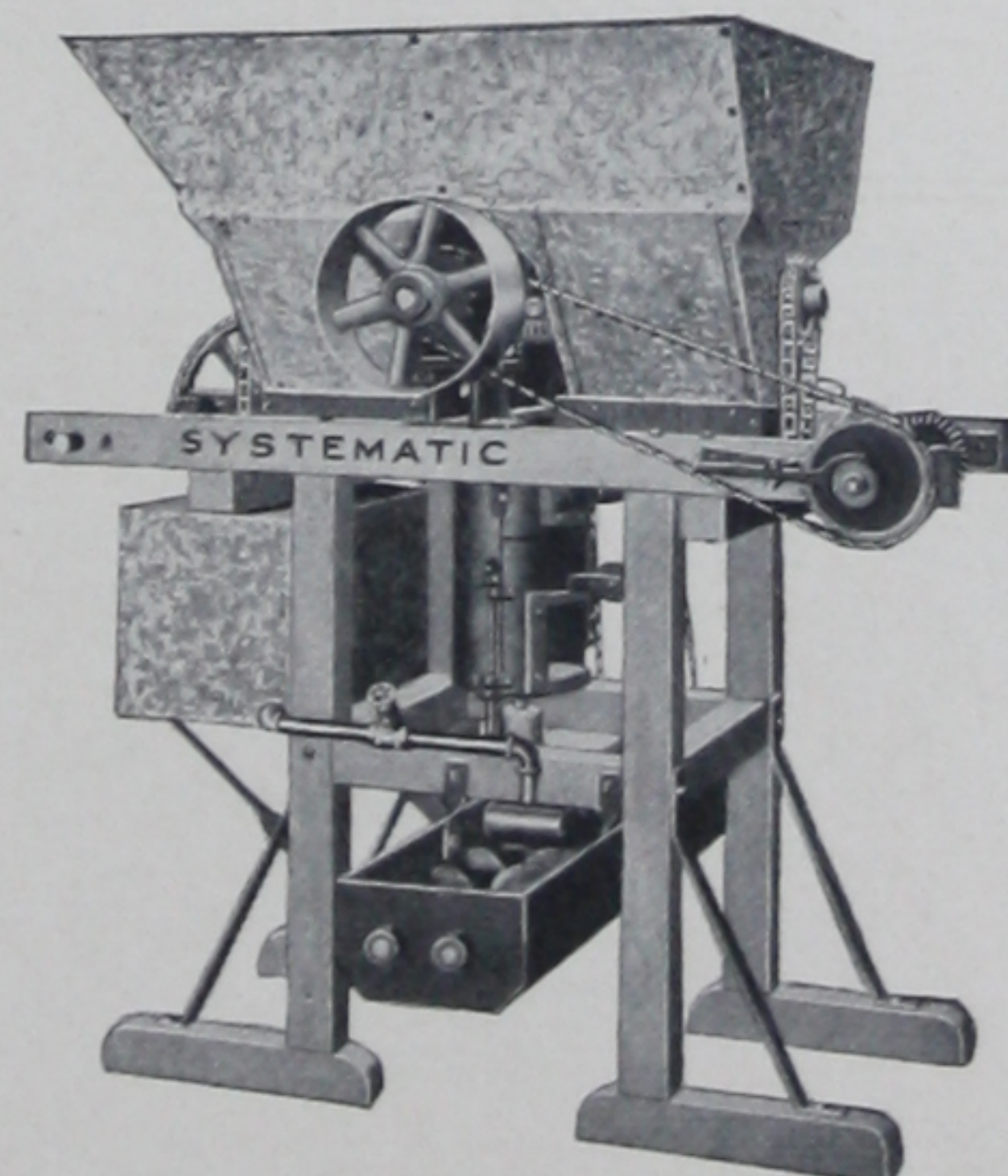
Champion Veneer Concrete Block Machine.



Favorite No. 2 Sand Cement Brick Machine.



Favorite No. 1 Concrete Brick Machine.



Systematic Mixer.

High Grade Concrete Machinery Manufactured by the Cement Machinery Company, Jackson, Michigan.

Above machines adopted twice by U. S. Government; received the highest awards at the Universal and Portland Expositions.



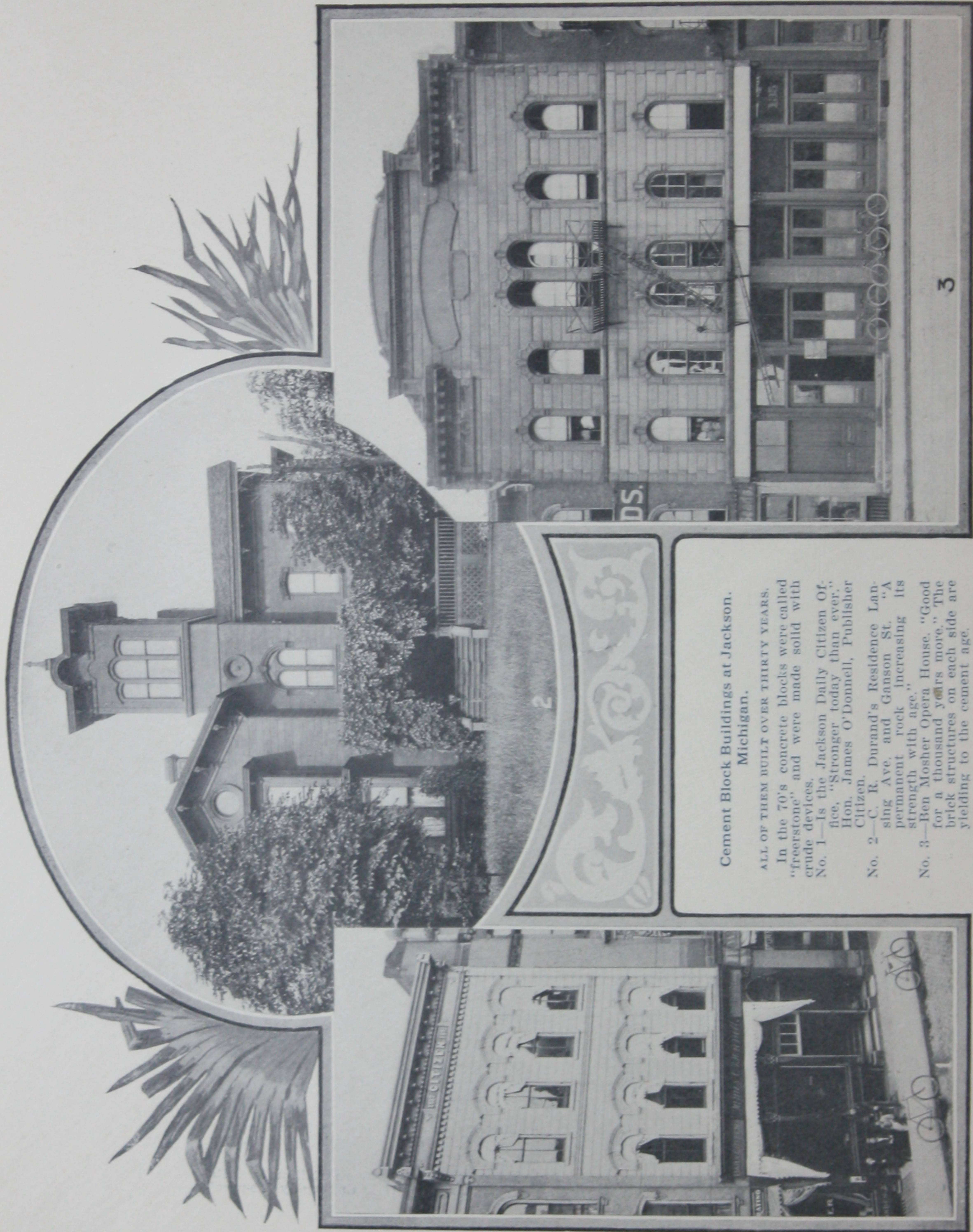
Cement Residences.

These houses, built out of Portland Cement imbedding expanded metal, give eminent satisfaction and are meeting with marked popularity, as cement constructions generally have done. When once such a building is erected in a community others of like character immediately follow it. Hence it is that certain localities like Southern California, Southern Ohio, and Northern Illinois afford so many illustrations of such structures.



The walls of the Ponce de Leon are built of concrete made from Portland Cement and Coquina sand. This hotel is probably more widely known than any other in Florida.

The Green Hotel is a magnificent structure in Southern California. Its walls are cement concrete embedding expanded metal. It is thoroughly fire-proof throughout.



Cement Block Buildings at Jackson,
Michigan.

ALL OF THEM BUILT OVER THIRTY YEARS.

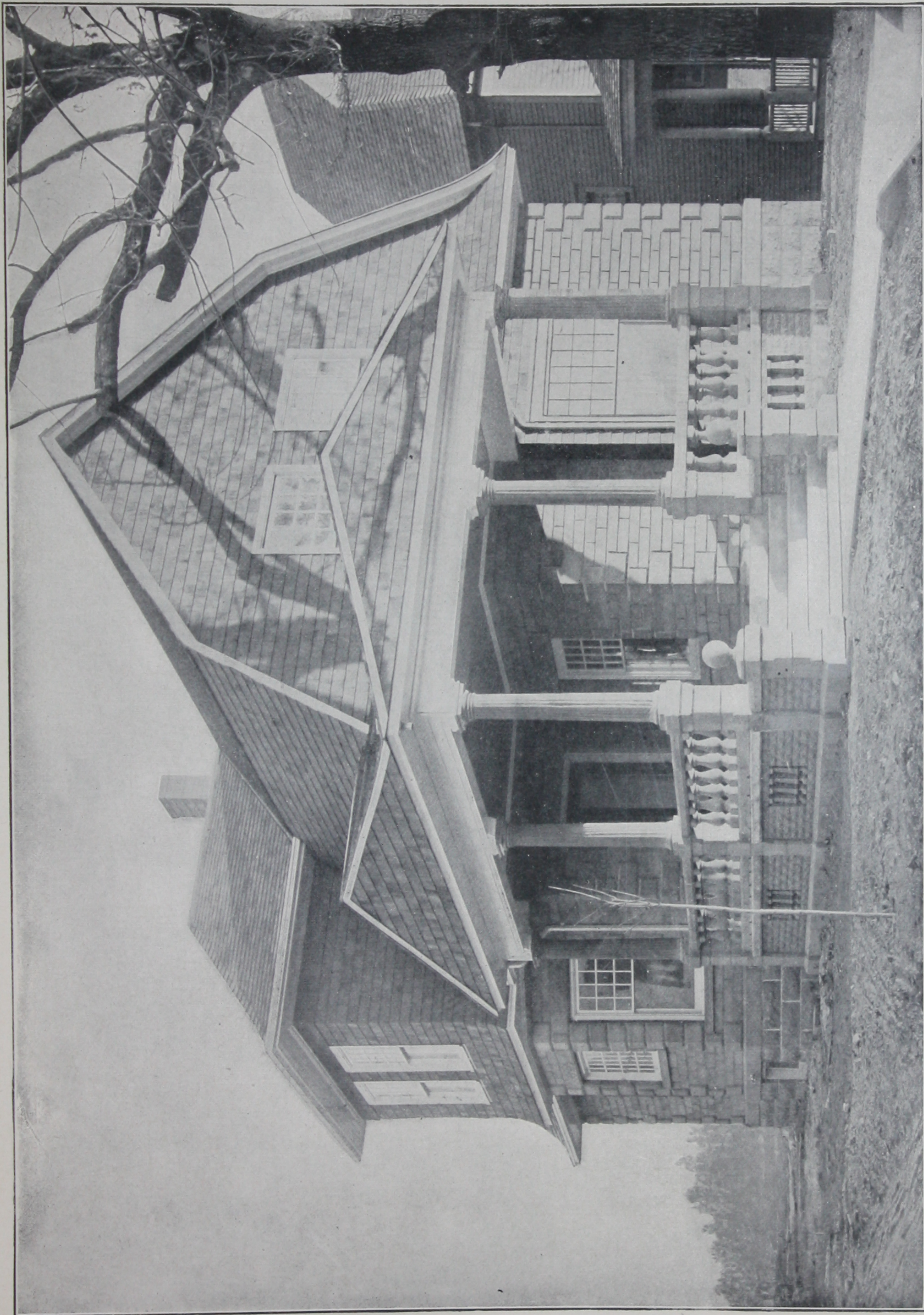
In the 70's concrete blocks were called "freestone" and were made solid with crude devices.

No. 1—Is the Jackson Daily Citizen Office, "Stronger today than ever."

Hon. James O'Donnell, Publisher Citizen.

No. 2—C. R. Durand's Residence Lansing Ave. and Ganson St. "A permanent rock increasing its strength with age."

No. 3—Ben Mosher Opera House, "Good for a thousand years more." The brick structures on each side are yielding to the cement age.



Residence Sid. L. Wilse, Sec. Cement Machinery Co., Jackson, Mich.

Total concrete work cost \$620.00. Same work in cut stone, estimated cost, \$2,800. The Concrete Blocks, Quoins, Plain Columns, Water table, Balusters, Rails, Piers and Copings made with the "Old Reliable" Normandin Block Machine. Balusters, Balls, Bases, Fluted Columns, Shafts and Capitals made with C. M. Co.'s ornamental molds. Sills and Caps made with Practical Sill-Cap, Step and Lintel Mold. Rock and Plain Faced Brick, used in porch and chimney, made with the Favorite Sand Cement Brick Machine. Retaining wall on right side, not shown in photo, 5x100 feet, built of blocks and coping made with Normandin machine.



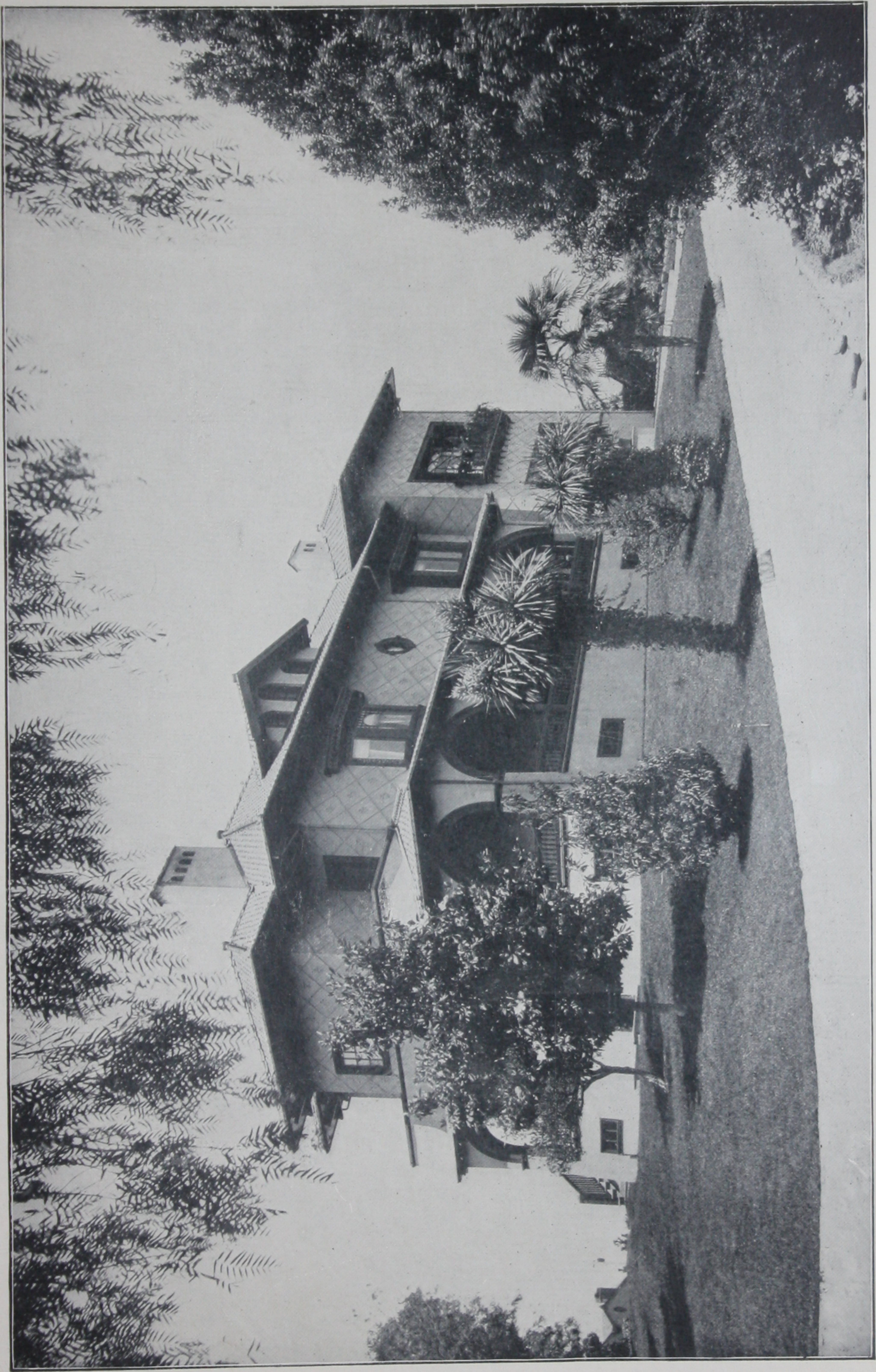
Broken Ashlar Residence, Columbus, Ohio.
Constructed entirely of Portland cement concrete building blocks, made by the Columbus Stone Co. with Normandin machines. "The stone" used.



Portland Cement Residence, Pittsburgh Pa.



The Beautiful new "Art Building" on the grounds of the Toronto Industrial Exhibition, Toronto, Ont.
Constructed entirely of Peninsular Portland Cement.



Cement Residence, Pasadena, Cal.

HOW TO USE PORTLAND CEMENT.

Character of
Materials used with
Cement

Sand, Its
Condition and Use

Gravel or
Crushed Rock

Preventing
Freezing

Proportions

Hand Mixing

Machine Mixing

Laying

Cellar Floors

Cement Mortar

SAND should be clean, sharp, coarse and free from loam or any other adhering matter. The importance of such an article in cement constructions cannot be over-estimated. Doubtless the day is not far distant when sand, too, will be selected and tested as to fitness for its purpose. If a small quantity of the sand to be used, stirred in a tumbler of clear water, muddies it much, the sand should be washed before being used. Chemically, the sand should be as purely silicious as possible, free from alumina and iron. Physically, it should be angular and rough though regular in size and not too fine or it will weaken the work. Its use in construction is the economy of cement, prevention of shrinkage, and the taking up of stresses due to expansion by heat.

Gravel or crushed stone should be clean and vary from one-quarter to two inches in size. Washed cinders or broken brick answer the same purpose. If work is done during winter months care must be taken to prevent freezing, warm water being preferable to cold in mixing concrete. Salt dissolved in the water will prevent freezing and is said to be not otherwise harmful than in producing at times an unpleasant efflorescence on the surface. A suitable proportion is an ounce of salt for each gallon of water at 29 degrees Fahrenheit, increased by one-fifth ounce per gallon for each additional fall in temperature of one degree.

Various proportions of sand and stone are mixed with one part of cement in concrete work, but for ordinary purposes, such as walk foundations, mill or machinery foundations, abutments, piers, etc., two or three parts of sand with from five to seven parts of crushed stone are mixed with one part of cement.

In mixing, all materials should be actually measured by volume. Mix cement and sand together by turning with a shovel until it shows a uniform color, usually three or four times turning will accomplish this; then add the necessary quantity of water and the required amount of stone previously wet, using only sufficient water to bind the materials together so that when thoroughly mixed by a shovel, the cement will not crumble or fall from the rock fragments. Too much water weakens concrete. Moisture of air and sand, and temperature at time of mixing, are varying factors in determining amount of water necessary. Where large quantities of concrete are required, machine mixing is preferable to hand mixing, both for economy and for better and quicker work; but any machine to be highly successful should provide for mixing thoroughly the dry sand and cement before wetting it.

See that the mixture, resembling moistened earth, is rammed properly into place in thin layers with a tamping iron till it shows a little moisture on the surface; put down quickly so that the layers adhere to each other. After concrete has become set, wet frequently with abundance of water for several days, especially on sidewalk work.

Cellar floors should be from three to four inches thick, concrete to vary in strength in proportion to the use the cellar is put to. For ordinary purposes a concrete mixture of one part cement, five parts sand, and ten parts stone will be sufficient. Top surface to be made same as sidewalk surface, one cement, one sand. One barrel of high-grade Portland Cement will lay about seventy-five square feet of good cellar floor.

For masonry and brick work, use one part of cement to five parts of clean sharp sand, adding about one-half part of fresh slacked lime to give the mortar a plastic nature in handling and to add to its adhesiveness, density and strength. Cheaper mixtures may be made by using with each additional two parts sand, one-half additional part lime paste. One barrel of high-grade Portland Cement should be sufficient to make enough mortar to lay up two thousand bricks, with quarter-inch joints. Bricks to be laid in cement should be soaked so as to prevent their absorbing from the cement the moisture it needs in setting.

Portland Cement mortar has valuable hydraulic properties, and is quick hardening, so that it can be used under water or in cold weather where no other mortar could be used. It is weather-proof and comparatively free from expansion and contraction, and has a much greater crushing and tensile strength than either lime or natural cement mortar.

Why Used

In laying sidewalks, depth of excavation depends greatly on soil; ordinarily about fifteen to eighteen inches should be excavated, and filled up to within four to six inches of the level with good ashes, cinder, gravel or stone, sprinkled and rammed well to prevent winter frosts from heaving pavement. Side strips of two-by-four should be set to keep walk in proper shape; then fill to within one-half inch of top of strips with concrete properly prepared; proportions either three parts sand, seven broken stone, to one cement; or even four parts sand, eight parts gravel or six parts broken stone, to one cement. Ram well, and before the sub-surface is hard set, clean and roughen it, fill the remaining one-half inch with top surface, composed of one part cement to one or two parts good sand, or coarsely ground marble dust or limestone, or trap rock screened from one-sixteenth to one-eighth inch in size. Obtain an even surface by working the top dressing backward and forward with the edge of a level board, resting on edges of strips on sides of walk; having worked it sufficiently to fill all pores, smooth the even surface by troweling it, but do not trowel too much, for excessive troweling produces air cracks. Blocks should be laid in four or five foot squares. A good plan is to lay every other block, returning to lay intervening blocks when the first are sufficiently set to allow removal of strips. Blocks should be kept from adhering closely together. Water-proof paper may be laid between them to accomplish this. For good work, dusting is to be avoided; but in case an excess of water be present on surface, it may be removed by dusting with mixture even parts sand and cement. However, if care is taken in previous mixing this will be unnecessary. The surface may be roughened or corrugated by using a roller or other device before cement has had its final set, never disturbing it after setting. When the cement has thoroughly set, the surface should be kept free from dirty water or dirt to give uniform color and be carefully covered over and kept moist for several days, thereby preventing cracks and obtaining a clean solid surface. A soft light gray effect may be given the surface by mixing with the dry cement about three-quarters of a pound of lamp-black to the barrel. Walks laid as suggested above will require seven to ten pounds of cement to the square foot. One barrel of high-grade Portland Cement will therefore lay about forty-five square feet of good sidewalk.

Sidewalks

Curbs and gutters should be made in one so as to bind together, and should be at least five inches thick at top and seven at bottom, sloping mostly on the walk or filled side so as to overcome the pressure outward on the top of the curb. They should be set in the ground fully six inches, and be in lengths of four or five feet. Surface of curb should be finished with a coat, one cement, one sand, and be carefully worked and troweled as soon as retaining board can be removed to admit of same. The edges should be beveled off, leaving no corners for contact with carriage or wagon wheels.

Curbs

Probably the best known material for street crossings is Portland Cement. Recently it has been extensively used for this purpose. Such a crossing is made having an arched top with the center slightly above the street level. Rains wash it and from its shape the center soon dries leaving a clean footing. The crossings are made like walks, five or six inches thick, with heavier topping according to the usage they are to receive. Sand for topping should be coarser than when used for sidewalk surface. In many cases these crossings are made on the grade of the sidewalk, bridging the gutters with a flat top arch and merging into the sidewalk, thus making easy access from the street. City authorities need only to see these crossings in use to adopt them on the spot.

Street Crossings

BELIEVING that men in general act according to their best judgment and modify their judgments by their own experience and that of others, and that intelligent men are seekers of truth and welcome it wherever they find it, we purpose making this book an educator for men willing to know the truth concerning best methods of building involved in the modern reform movement now going on in construction work.

Men of the business world are all looking for the best thing and the most of it for the least money. They want what the devastating elements cannot rob them of and what will therefore be as good to-morrow as it is to-day. There is no field in the world where this desire should be more intense than in the construction arts.

Such thoughts as these have inspired us in gathering much of the material arranged in the preceding pages to acquaint men with the merits of the one thing best in building materials, Portland Cement.

THE great Works of the Cowham System of Portland Cement Mills are in constant operation, and if you want a good cement, buy your product from a progressive, wideawake organization, where most approved modern methods are used in its production. They can give you the best. You get what the world cannot better when you buy

THESE BRANDS.





